UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/48/305
15 October 1993

ORIGINAL: ENGLISH

Forty-eighth session
Agenda item 70

PREVENTION OF AN ARMS RACE IN OUTER SPACE

Study on the application of confidence-building measures in outer space

Report by the Secretary-General

1. The General Assembly, in its resolution 45/55 B of 4 December 1990, requested the Secretary-General, with assistance of a group of governmental experts, to carry out a study on the specific aspects related to the application of different confidence-building measures in outer space, including the different technologies available, possibilities for defining appropriate mechanisms of international cooperation in specific areas of interest, and to report thereon to the Assembly at its forty-eighth session.

2. Pursuant to that resolution, the Secretary-General has the honour to submit to the General Assembly the Study on the Application of Confidence-building Measures in Outer Space (see annex).

ANNEX

Study on the application of confidence-building measures in outer space

CONTENTS

	Paragraphs	Page
Acronyms and abbreviations		6
Letter of transmittal		10
Foreword by the Secretary-General		12
I. INTRODUCTION	1 - 16	13
II. OVERVIEW	17 - 55	17
A. Current uses of outer space	18 - 44	17
1. Imaging satellites	25 - 26	23
2. Signals intelligence satellites	27 - 28	23
3. Early warning satellites	29	23
4. Weather satellites	30	23
5. Nuclear explosion detection systems	31	24
6. Communication satellites	32	24
7. Navigation satellites	33	24
8. Anti-satellite weapons	34 - 40	24
9. Anti-missile weapons	41 - 44	25
B. Emerging trends	45 - 55	26
1. Other States' space capability	46 - 48	26
2. Increasing numbers and capabilities	49 - 50	27
3. Dual-use systems	51 - 54	27
4. Combat applications	55	28

CONTENTS (continued)

		Paragraphs	Page
III.	EXISTING LEGAL FRAMEWORK: AGREEMENTS AND DECLARATIONS OF PRINCIPLES	56 - 80	29
	A. Global multilateral agreements	59	29
	1. Outer Space Treaty	59 - 60	29
	2. Other global multilateral agreements	61 - 67	34
	B. Bilateral treaties	68 - 75	36
	C. United Nations General Assembly resolutions on declarations of principles	76 - 80	38
IV.	GENERAL CONSIDERATIONS OF THE CONCEPT OF CONFIDENCE-BUILDING MEASURES	81 - 114	40
	A. Characteristics	91 - 103	41
	B. Criteria	104 - 109	43
	C. Applicability	110 - 114	44
V.	SPECIFIC ASPECTS OF CONFIDENCE-BUILDING MEASURES IN OUTER SPACE	115 - 175	46
	A. Specific features of the space environment	117 - 129	46
	B. Political and legal	130 - 138	48
	C. Technological and scientific	139	49
	1. Technology and outer space	144 - 158	50
	(a) Technology for monitoring space operations	146 - 147	50
	(b) Ground-based passive optical systems	147 - 149	50
	(c) Ground-based active optical systems	150	51
	(d) Ground-based radars	151 - 152	51
	(e) Other technical means of monitoring space characteristics	153 - 154	51
	(f) Monitoring space weapons	155 - 158	52

CONTENTS (continued)

		Paragraphs	Page
2.	Technology and confidence-building measures	159	52
(a)	PAXSAT-A	163	53
(b)	Satellites for monitoring terrestrial activities	163 - 165	53
(c)	International Satellite Monitoring Agency (ISMA)	166	53
(d)	International Space Monitoring Agency (ISpMA)	167	54
(e)	PAXSAT-B	174 - 175	55
VI.	CONFIDENCE-BUILDING MEASURES	176	56
A.	The need for confidence-building measures in outer space	176 - 184	56
B.	Proposals for specific confidence-building measures in outer space	185 - 225	57
	Overviews of proposals		57
1.	Confidence-building measures on a voluntary and reciprocal basis	189 - 193	63
2.	Confidence-building measures on a contractual obligation basis	194 - 203	64
3.	Proposals for institutional framework	204 - 207	66
4.	The international transfer of missiles and other sensitive technologies	208 - 214	67
5.	Proposals for confidence-building measures in outer space within bilateral United States of America-Union of Soviet Socialist Republics negotiations	215 - 219	68
6.	Other proposals	220 - 225	69
C.	Analysis	226 - 244	71
1.	General measures to enhance transparency and confidence	227 - 230	71

CONTENTS (continued)

		Paragraphs	Page
	2. Strengthening the registration of space objects and other related measures	231 - 235	71
	3. Code of conduct and rules of the road	236 - 242	72
	4. The international transfer of missile and other sensitive technologies	243 - 244	73
VII.	MECHANISMS OF INTERNATIONAL COOPERATION RELATED TO CONFIDENCE-BUILDING MEASURES IN OUTER SPACE	245 - 293	74
	A. Existing mechanisms of international cooperation in outer space	247	74
	1. Global mechanisms	248 - 262	74
	2. Regional multilateral mechanisms	263 - 274	77
	3. Bilateral mechanisms	275 - 281	79
	B. Some proposals for creating new international mechanisms	282 - 293	80
VIII.	CONCLUSIONS AND RECOMMENDATIONS	294 - 331	84

APPENDICES

I.	Text of the Outer Space Treaty	97
II.	Guidelines adopted by the United Nations Disarmament Commission	103
III.	Status of multilateral treaties relating to activities in outer space	115
	Selected bibliography on technical, political and legal aspects of outer space activities	125

ACRONYMS AND ABBREVIATIONS

ABM	Anti-ballistic missile
ABM Treaty	Anti-Ballistic Missile Treaty
ARABSAT	Arab Satellite Communication Organization
ASAT	Anti-Satellite
BMD	Ballistic missile defence
CBM	Confidence-building measure
CCD	Charge-coupled device
CD	Conference on Disarmament
CEPT	European Conference of Postal and Telecommunications Administrations
COPUOS	Committee on Peaceful Uses of Outer Space
COSPAS-SARSAT	Space system for tracking ships in distress - search and rescue satellite
EHF	Extremely high frequency
ELINT	Electronic intelligence
ENMOD Convention	Convention on the Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques
ESA	European Space Agency
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EUTELSAT	European Telecommunications Satellite Organization
GPALS	Global protection against limited strikes
GPS	Global positioning system
HOT LINE AGREEMENT	Agreement between the United States of America and the Union of Soviet Socialist Republics on Measures to Reduce the Risk of Outbreak of Nuclear War
ICBM	Intercontinental ballistic missile
IFRB	International Frequency Registration Board

IMO	International Maritime Organization
INF Treaty	Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles
INMARSAT	International Maritime Satellite Organization
INTELSAT	International Telecommunications Satellite Organization
INTERCOSMOS	Council on International Cooperation in the Study and Utilization of Outer Space
INTERSPUTNIK	International Organization of Space Communications
IPIC	Image Processing and Interpretation Centre
ISI	International Space Inspectorate
ISMA	International Satellite Monitoring Agency
ISpMA	International Space Monitoring Agency
ITU	International Telecommunication Union
LIABILITY CONVENTION	Convention on International Liability for Damage Caused by Space Objects
LPAR	Large phased array radar
MOON AGREEMENT	Agreement Governing the Activities on the Moon and Other Celestial Bodies
MTCR	Missile Technology Control Regime
NOTIFICATION OF LAUNCHES AGREEMENT	Agreement between the Union of Soviet Socialist Republics and the United States of America on Notification of Launches of Intercontinental Ballistic Missiles and Submarine-launched Ballistic Missiles
NTMs	National technical means of verification
NUCLEAR ACCIDENT AGREEMENT	Agreement between the Union of Soviet Socialist Republics and the United States of America on Measures to Reduce the Risk of Outbreak of Nuclear War
OUTER SPACE TREATY	Treaty on Principles Governing the Activities of States in the Exploration of Outer Space, Including the Moon and Other Celestial Bodies
PAROS	Prevention of an Arms Race in Outer Space

PREVENTION OF DANGEROUS MILITARY ACTIVITIES AGREEMENT	Agreement between the Union of Soviet Socialist Republics and the United States of America on the Prevention of Dangerous Military Activities
PTBT	Treaty on Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water
REGISTRATION CONVENTION	Convention on the Registration of Objects Launched into Outer Space
RESCUE AGREEMENT	Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space
RIO	Regional international organizations
RISK REDUCTION AGREEMENT	Agreement between the Union of Soviet Socialist Republics and the United States of America on the Establishment of Nuclear Risk Reduction Centres
RV	Re-entry vehicle
SALT	Strategic Arms Limitation Talks
SIGINT	Signal intelligence
SIPA	Satellite Image Processing Agency
SLBM	Submarine-launched ballistic missile
SPIC	Space Processing Inspectorate Centre
SPOT	Système Probatoire d'Observation de la Terre
START-I	Treaty on Reduction and Limitation of Strategic Offensive Arms
START-II	Treaty on Further Reduction and Limitation of Strategic Offensive Arms
UHF	Ultra-high frequency
UNDC	United Nations Disarmament Commission
UNIDIR	United Nations Institute for Disarmament Research
UNISPACE	United Nations Conference on the Exploration and Peaceful Uses of Outer Space
UNITRACE	International Trajectography Centre
WEU	Western European Union

WMO	World Meteorological Organization
WSO	World Space Organization

LETTER OF TRANSMITTAL

16 July 1993

Sir,

I have the honour to submit herewith the report of the Group of Governmental Experts to Undertake a Study on the Application of Confidence-Building Measures in Outer Space, which was appointed by you in accordance with paragraph 3 of General Assembly resolution 45/55 B of 4 December 1990.

The Governmental Experts appointed were the following:

Dr. Mohamed Ezz El Din Abdel-Moneim, Deputy Director
Department of International Organizations
Ministry of Foreign Affairs
Cairo, Egypt

Mr. Sergey D. Chuvakhin
Department for Arms Reduction and Disarmament
Ministry of Foreign Affairs of Russia
Moscow, Russian Federation

Mr. F. R. Cleminson, Head
Verification and Research Section
Arms Control and Disarmament Division
Department of External Affairs
Ottawa, Canada

Dr. Radoslav Deyanov, Minister Plenipotentiary
Head, Arms Control and Disarmament Division
Department of International Organizations
Ministry of Foreign Affairs
Sophia, Bulgaria

Mr. Luiz Alberto Figueiredo Machado, First Secretary
Ministério das Relaçoes Exteriores
Departamento do Meio Ambiente
Brasilia, Brazil

Mr. P. Hobwani
Ministry of Foreign Affairs
Harare, Zimbabwe

Dr. C. Raja Mohan, Associate Professor
Institute for Defence Studies and Analyses
New Delhi, India

Mr. Pierre-Henri Pisani, Special Adviser
Directorate for International Relations
Centre National d'Etudes Spatiales
Paris, France

Mr. Archelaus R. Turrentine
Bureau of Multilateral Affairs
United States Arms Control and Disarmament Agency
Washington, D.C., United States of America

Mr. Sikandar Zaman, Chairman
Pakistan Space and Upper Atmosphere Research Commission
Karachi, Pakistan

The report was prepared between July 1991 and July 1993, during which period the Group held four sessions in New York: the first from 29 July to 2 August 1991; the second from 23 to 27 March 1992; the third from 1 to 12 March 1993; and the fourth from 6 to 16 July 1993.

At the third session of the Group, Mr. SHA Zukang of the People's Republic of China participated as an expert and, at the fourth session, Mr. WU Chengjiang of the People's Republic of China participated as an expert.

In carrying out its work, the Group had before it relevant publications and papers which were circulated by members of the Group.

The members of the Group wish to express their appreciation for the assistance which they received from members of the Secretariat. They wish, in particular, to thank Mr. Davinić, Director, Office for Disarmament Affairs, and Ms. Olga Sukovic, who served as Secretary of the Group.

I have been requested by the Group of Experts, as its Chairman, to submit to you, on its behalf, the present report, which was unanimously approved.

In not blocking consensus and allowing the study to go forward in its final form, the expert from the United States indicated that he had received additional comments and reservations from his Government regarding the study which would be conveyed to the Secretary-General. I have been informed that those comments and reservations will be circulated separately as a United Nations document under agenda item 70.

(Signed) Robert GARCIA-MORITAN
Chairman of the Group of Governmental
Experts on the Study on the Application
of Confidence-Building Measures in
Outer Space

Foreword by the Secretary-General

All States have the right to explore and beneficially use our common space environment. For the international community, the constant challenge of the space age has been to expand human horizons through the peaceful exploration and use of outer space, while also preventing space and space technology from being used for threatening or destructive purposes.

Outer space issues have been on the United Nations agenda for nearly four decades now. During that time, international agreements on outer space have aimed at preventing the militarization of outer space, and ensuring access by all States to the potential benefits of space-related technology.

Technology is a dynamic force. Rapid developments and growing disparities in space technology capabilities have inevitably generated a certain degree of mistrust and suspicion. The insufficient application of space technologies to development needs to be addressed. As more and more countries have become involved in space activities, the need for greater bilateral and multilateral cooperation has become urgently apparent. Cooperation is essential if we are to succeed in safeguarding outer space for peaceful purposes and bring the benefits of space technology to all States.

A new international environment has now been created. The post-cold-war era has witnessed many dramatic and far-reaching changes. But the world remains a dangerous place.

To avoid conflicts based on misperceptions and mistrust, it is imperative that we promote transparency and other confidence-building measures - in armaments, in threatening technologies, in space and elsewhere.

I am encouraged by the growing international recognition of the need for confidence-building measures on issues involving outer space. Building cooperation and confidence must be a high priority, for confidence and cooperation are contagious. International cooperation in space technology can help to pave the way for further cooperation in other areas - political, military, economic and social.

I believe that it was with this intent and in this spirit that the General Assembly requested the study on confidence-building measures in outer space. The study is a useful reference and a thought-provoking resource. I hope that it will help to harmonize views, and that it will contribute to building a strong international consensus on outer space issues.

I wish to express my sincere appreciation to the members of the Group of Experts for their work in preparing the present report. I commend the report to the General Assembly, and urge that it be given close consideration.

Boutros Boutros-Ghali
Secretary-General
United Nations

I. INTRODUCTION

1. Since the launching of the first man-made satellite into outer space in 1957, outer space questions have been discussed in various forums of the United Nations and its related organizations. From the point of view of this study, the main relevant organ is the Conference on Disarmament (CD) and its subsidiary body, the Ad Hoc Committee on the Prevention of an Arms Race in Outer Space, which has had on its agenda since 1982 an item entitled "Prevention of an arms race in outer space" and which has been examining, through substantive and general consideration, issues relevant to outer space. As far as peaceful uses of outer space are concerned, the most relevant body is the Committee on the Peaceful Uses of Outer Space (COPUOS), with its Legal Subcommittee, and its Scientific and Technical Subcommittee. The deliberations of COPUOS contributed to the conclusion of several international legal instruments concerning the peaceful aspects of the uses of outer space.

2. The space age, which began nearly four decades ago, has also been characterized by a rapid development in the field of space technology and by the inherent dangers of an arms race in outer space causing increased concerns. In 1978, the General Assembly formally recognized such concerns in the Final Document of its tenth special session, the first special session devoted to disarmament, 1/ and called for additional measures to be taken and appropriate international negotiations to be held on that issue. Many Member States considered it necessary to take further measures to preclude the possibility of the militarization of outer space.

3. Over the years, Member States have pursued two separate set of outer space interests in international forums - those related to peaceful application and those related to the prevention of an arms race. As the scope of military and national security activities in outer space has grown, so have concerns by many States about the risk of an arms race in outer space. At the same time, there has been an attempt to keep in perspective the potential benefits of applying to civil purposes space technologies initially developed under military and national security programmes. It is in connection with military and related security activities that proposals have been made on a set of rules whose purpose would be to increase confidence among States generally and particularly in specific areas of their space activities.

4. In 1993, there were about 300 operational satellites in orbit, more than half of them with military or national security-related missions. In addition to the two main space Powers, there is a large group of States that have achieved self-sufficiency with specific space missions. Also, there are a number of States that have space-related capabilities in specialized technologies or facilities, while there is a growing interest by the vast majority of States that would like to participate in the activities in outer space and to share space technology.

5. In view of the absence of full-scale arrangements to prevent an arms race in outer space, interest has grown in building confidence through acceptance of certain measures, guidelines or commitments among States regarding space-related activities. Many believe that such measures would constitute a constructive move towards the prevention of an arms race in outer space. The purpose of such

measures is to obtain greater transparency and predictability in space activities in general, through such measures as prior notification, verification, monitoring, code of conduct; thus, contributing to global and regional security.

6. At its forty-fifth session, on 4 December 1990, the General Assembly adopted two resolutions concerning outer space. By resolution 45/55 A entitled "Prevention of an arms race in outer space", the General Assembly expressed its conviction, inter alia, "that further measures should be examined in the search for effective and verifiable bilateral and multilateral agreements in order to prevent an arms race in outer space", and reaffirmed "the importance and urgency of preventing an arms race in outer space and the readiness of all States to contribute to that common objective, in conformity with the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies" (further referred to as Outer Space Treaty). It further recognized "the relevance of considering measures in confidence-building and greater transparency and openness in space", and requested the Conference on Disarmament "to continue building upon areas of convergence with a view to undertaking negotiations for the conclusion of an agreement or agreements, as appropriate, to prevent an arms race in outer space in all its aspects".

7. By the second resolution 45/55 B, entitled "Confidence-building measures in outer space", the General Assembly requested the Secretary-General to carry out, with the assistance of governmental experts, the present study. It reads as follows:

"The General Assembly,

"Conscious of the importance and urgency of preventing an arms race in outer space,

"Recalling that, in accordance with the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 2/ the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind,

"Aware of the fact that more and more States are taking an active interest in outer space or participating in important space programmes for the exploration and exploitation of that environment,

"Recognizing, in this context, the relevancy space has gained as an important factor for the socio-economic development of many States, in addition to its undeniable role in security issues,

"Emphasizing that the growing use of outer space has increased the need for more transparency as well as confidence-building measures,

"Recalling that the international community has unanimously recognized the importance and usefulness of confidence-building measures, which can

significantly contribute to the promotion of peace and security and disarmament, in particular through General Assembly resolutions 43/78 H of 7 December 1988 and 44/116 U of 15 December 1989,

"Noting the important work being carried out by the Ad Hoc Committee on the Prevention of an Arms Race in Outer Space of the Conference on Disarmament, which contributes to identifying potential areas of confidence-building measures,

"Aware of the existence of a number of different proposals and initiatives addressing this subject, which attests to a growing convergence of views,

"1. Reaffirms the importance of confidence-building measures as means conducive to ensuring the attainment of the objective of the prevention of an arms race in outer space;

"2. Recognizes their applicability in the space environment under specific criteria yet to be defined;

"3. Requests the Secretary-General to carry out, with the assistance of government experts, a study on the specific aspects related to the application of different confidence-building measures in outer space, including the different technologies available, possibilities for defining appropriate mechanisms of international cooperation in specific areas of interest and so on, and to report thereon to the General Assembly at its forty-eighth session."

8. After the adoption of the above-mentioned resolutions, the United Nations General Assembly has adopted two resolutions under the agenda item entitled "Prevention of an arms race in outer space". By resolution 46/33 of 6 December 1991, the Assembly again requested the Conference on Disarmament "to consider as a matter of priority the question of preventing an arms race in outer space", recognized, inter alia, "the relevance of considering measures on confidence-building and greater transparency and openness in space" and, by resolution 47/51 of 9 December 1992, recognized, "the growing convergence of views on the elaboration of measures designed to strengthen transparency, confidence and security in the uses of outer space."

9. In fulfilling its mandate, the Group decided to divide the study into eight chapters. In addition, it considered it useful to include as annexes a number of texts relevant to the study, as well as a selected bibliography.

10. After this introductory chapter, chapter II of the present study considers the current uses of outer space and emerging trends with special emphasis on the technical problems involved, such as different types of satellites and their missions, anti-satellite weapons and anti-missile weapons. When it refers to emerging trends, emphasis is put on States' space capabilities, dual-use systems and combat applications.

11. The third chapter deals with the existing legal framework: global multilateral agreements and bilateral agreements concerning both military and peaceful aspects of the exploration and uses of outer space, as well as with a

number of resolutions containing declarations of principles adopted by the United Nations General Assembly.

12. The fourth chapter addresses the overall question of confidence-building measures. Such measures have found increasing application in a wide range of contexts, including global, regional and bilateral security environments. They have been used to address security concerns raised by conventional weapons, as well as nuclear weapons and other weapons of mass destruction. A number of common characteristics of confidence-building measures are identified, and several broad criteria are noted for their successful implementation. Also, the applicability of such measures is considered.

13. The fifth chapter covers specific aspects of confidence-building measures as they apply to outer space. Political, legal, technological and scientific considerations are analysed with regard to their implementation. Technological opportunities and constraints are identified both for confidence-building in space, that is, those measures pertaining to space operations, as well as confidence-building from space, that is, measures that use space technology.

14. The sixth chapter addresses specific confidence-building measures in outer space that have been proposed by various Governments, and considers various aspects of their potential implementation.

15. The seventh chapter reviews the range of mechanisms of international cooperation related to confidence-building measures in outer space. This includes the role of the United Nations, the Conference on Disarmament, as well as some other global, regional, bilateral and other forums for their development and implementation. It also addresses some proposals for creation of new international mechanisms.

16. The final chapter contains the conclusions and recommendations of the Expert Group.

II. OVERVIEW

17. The dream of humanity to make the fullest possible use of outer space for the development of science and the well-being of humankind has not yet been fulfilled and thus remains a purpose to be achieved. There have been major achievements in space sciences including the Earth and atmospheric observational sciences, and lunar and interplanetary exploration, and these are becoming the basis of environmental sciences of the future. There have been significant achievements as well in space applications such as communications, navigation, search and rescue, meteorology, and Earth-remote sensing for many purposes. Space has become an important factor in the social and economic well-being of many States.

18. Since the launch of the first sputnik in 1957, the Union of Soviet Socialist Republics, 3/ the United States and a growing number of other countries have used space for military purposes. This fact determines the context in which the idea of confidence-building measures in outer space has been developed. Most of the approximately 300 satellites 4/ currently operational in Earth orbit are used in conjunction with military missions both for peacetime operations and increasingly directly in support of military forces on Earth. Communication, navigation, observation, weather and other satellites help, inter alia, to increase the effectiveness of terrestrial military systems.

19. The development of and/or access to a space launch capability is essential to the effective exploitation of space or peaceful and commercial purposes and in support of the arms regulation processes, as well as for military purposes. Much remains to be done, through satellites and other forms of space craft, in areas of space science, solar and interplanetary research, space biology, environmental and other purposes.

A. Current uses of outer space

20. The development of space research and applications was made possible by the constant improvement of available launching systems, in some cases driven by military needs. Two categories of launch systems exist:

(a) Reusable space transport systems the primary function of which is to assure manned flights and service of in-orbit infrastructures; their reliability must be the highest possible, taking into account the human presence on-board;

(b) Expendable launching systems which according to their capacity in terms of thrust can put into different orbits payloads of varying masses. The recent evolution witnessed in the field of disarmament enables one to envisage the use of converted missiles to put payloads into low-Earth orbit.

21. Satellites typically are deployed in four types of orbits, which are defined by their altitude, period and inclination to the Earth's equator (figure 1).

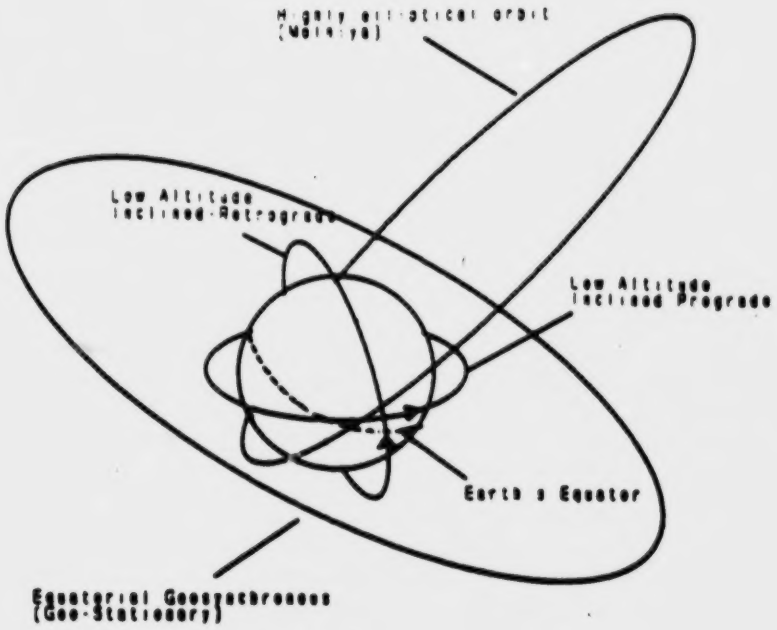
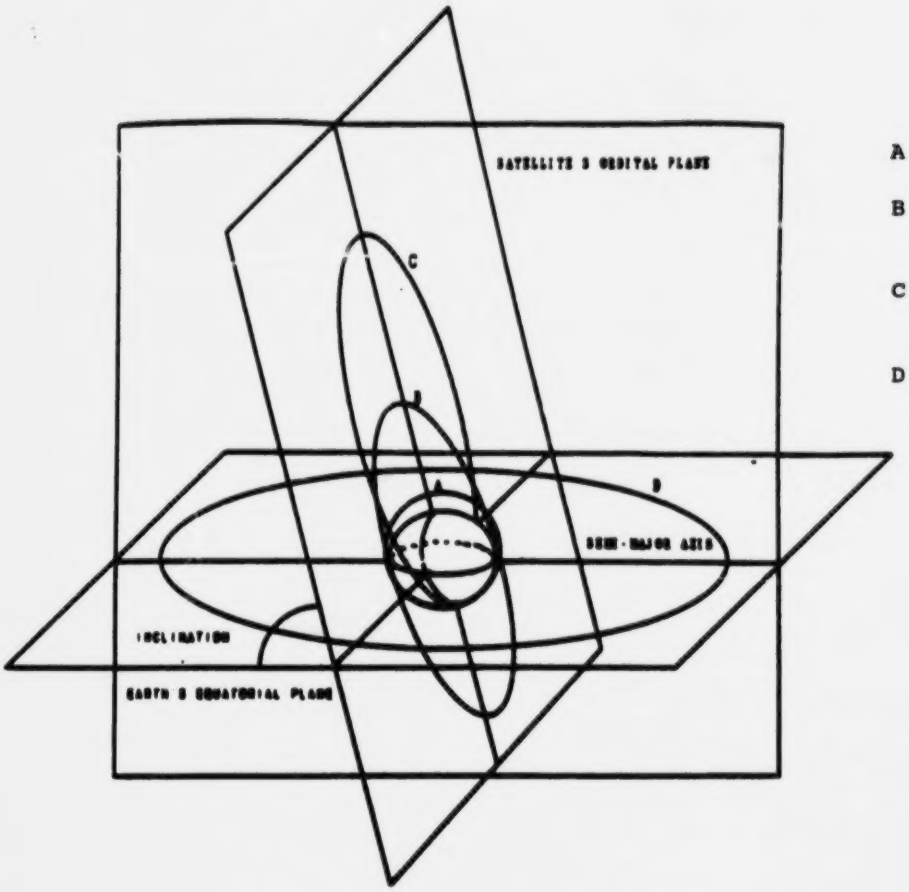


Figure I. Representative satellite orbits

All simple satellite orbits involve elliptical motion in a plane fixed in celestial space and passing through the centre of mass of the system (typically Earth), while the Earth rotates beneath the spacecraft and its orbit.



A Low Earth orbit

B Circular semi-synchronous orbit

C Elliptic semi-synchronous orbit

D Geosynchronous orbit

Figure II. Representative satellite orbits

All simple satellite orbits involve elliptical motion in a plane fixed in celestial space and passing through the centre of mass of the system (typically Earth), while the Earth rotates beneath the spacecraft and its orbit.

(a) Low Earth orbits include those with altitudes of a few hundred to over 1,000 kilometres, which may be of any inclination, although typically such orbits are at high inclinations in order to maximize coverage of high-latitude portions of the Earth's surface;

(b) Geosynchronous orbits are at an altitude of nearly 36,000 kilometres, and have a period of about one day, permitting a satellite to view instantaneously nearly half the Earth's surface. Such orbits are useful for communications, early warning or electronic intelligence collection. If the satellite is in the orbit plane of the Earth's equator (zero inclination), such orbits are called geostationary, and provide single satellite full-time coverage of an area;

(c) Semi-synchronous orbits have a period of 12 hours, with satellites at an altitude of about 20,000 kilometres. Circular semi-synchronous orbits are primarily used by modern navigation satellites;

(d) Molniya orbits are a subset of semi-synchronous orbits, which are highly elliptical, having low points (perigees) of a few hundred kilometres, and high points (apogees) of nearly 40,000 kilometres. Those orbits typically have inclinations of 63 degrees, and are used for coverage of polar and high-latitude regions.

22. Space systems may also be categorized by the functions they serve, as illustrated in table 1 and discussed in more detail in the following sections. As with other satellites, military satellites generally perform two types of functions: acquisition of information; and transmission of information. Satellites can be used to acquire information concerning the disposition of terrestrial military forces using imagery or by picking up electronic transmissions (electronic intelligence or ELINT, and signal intelligence or SIGINT). Other information acquisition functions include weather, missile alerting, and nuclear explosion detection. Certain information is relayed by communications and navigation satellites.

23. In recent years, there has been a trend towards greater openness and transparency with regard to many space activities, including a number that serve military purposes. Nevertheless, it should be recognized that some details on the precise capabilities and operations of satellites with military missions are likely to continue to be considered highly classified by States to which they belong.

24. It also must be noted that most space technologies are prime examples of technologies which have a dual-use potential. Satellites, which are essential in many applications in the civil sector, for example weather satellites, are also seen as significant force-multipliers when used for military purposes. The technology required to intercept satellites in space is, in some respects, similar to that required to intercept ballistic missiles or their warheads. Expertise in the anti-ballistic missile (ABM) field, could constitute a direct technological basis from which to design an ASAT capability. The reverse is not necessarily true.

Table 1. General characteristics of some typical space missions

Mission	Typical orbits	Power	Space craft features/ sensors/instruments	Notes
		A. Science		
Atmospheric and upper atmospheric observation	Low altitude High inclination	Low Medium	Optical near infrared and infrared sensors	Life of 2-5 years
Radiation and magnetic field measurement	Elliptical, high altitude and high inclination	Low	Magnetometers, radiation sensors charged particle detectors	Life of 5-8 years
Solar	Solar orbits some out of solar plane orbits	Moderate	Electro-optical, radiation, magnetic and particle sensors, with complex thermal control	
Inter-planetary	Planetary, sling-shots	Moderate	Electro-optical, radian measurement sensors, special long-distance data transmission systems	Many include fly-bys, orbiters, landers, carrying similar systems as Earth science systems
		B. Earth observations		
Land, vegetation and water resources monitoring	Low altitude inclined	Low-moderate	Optical infrared, multi-spectral sensors Synthetic Aperture Radars with large antennas, with wide band data links	Life of 5-8 years, some have off-track pointing capability, some have on-board data
Atmospheric and meteorological monitoring	Low altitude inclined	Low-medium	Optical, near infrared and infrared sensors	Life of 5-8 years
Environmental monitoring	Low altitude inclined	Low	Sensors to measure constituent gases in atmosphere	Life of 5-7 years
Air traffic monitoring	Medium altitude inclined	Very high	Space-borne radars with very large antennas	Life of 5 or more years

Mission	Typical orbits	Power	Space craft features/ sensors/instruments	Notes
		C. Communications		
International and domestic	Highly elliptical, highly inclined Geo-Syn equatorial	High	Multi-frequency transponders and antennas	10-15 year life with station-keeping capabilities - voice, data and video communications
Direct Broadcasting System	Geo-Syn equatorial	High	High-frequency transmitters and antennas	Direct broadcast of radio and TV programmes 10-12 years of life
Mobile	Geo-Syn equatorial	High	Large low-frequency transmitters and antennas	e.g. M-Satellite of INMARSAT
Personal	Low-altitude constellation	Low-moderate	Ant. config. multiple satellites	Constellation of satellites
Military	Geo-Syn equatorial	High	UHF to EHF frequency transmitters and antennas, with encryption mechanism	Life of 10-15 years. Also used for data transmission
Search and rescue	Low altitude	Moderate	Receivers and transmitters with doppler effect measurement capabilities	Picks up signals from an activated beacon, when beacon-carrier is in emergency
		D. Navigation		
Navigation and global positioning	Medium altitude inclined	Moderate	Precision time and frequency measurement	Constellation of satellites, providing aircraft and land applications

1. Imaging satellites

25. Imaging satellites, orbiting at altitudes of several hundred kilometres, make use of film, electro-optical cameras or radars, to produce high resolution images of the surface of the Earth in various regions of the spectrum. Such satellite imaging can be readily used to detect objects on the ground or at sea and, in the case of some military satellite systems of highest resolution, to identify and distinguish between different types of vehicles and other equipment. Perhaps their most significant applications have been as national technical means (NTM) of verifying arms limitation agreements.

26. Use of optical imagery from civilian satellites, such as LANDSAT, SPOT and the COSMOS series, have already been used to detect certain anomalies as in the case of the Chernobyl accident (1986) and the extent of environmental concerns in terms of the Gulf War (1991). Military reconnaissance satellites and their associated analytical capabilities are generally much more effective in this regard.

2. Signals intelligence satellites

27. Signals intelligence satellites are designed to detect transmissions from terrestrial communications systems, as well as radars and other electronic systems. The interception of such transmissions can provide information on the type and location of even low power transmitters, such as hand-held radios. However, these satellites are not capable of intercepting communications carried over land lines.

28. Signals intelligence consists of several categories. Communications intelligence is directed at the analysis of the source and content of message traffic. While most important military communications are protected by encryption techniques, computer processing can be used to decrypt some traffic, and additional intelligence can be derived from analysis of patterns of transmissions over time. Electronic intelligence is devoted to analysis of non-communications electronic transmissions. This would include telemetry from missile tests, or radar transmitters.

3. Early warning satellites

29. Early warning satellites carry infrared sensors that detect the heat from a rocket's engines. These satellites are used for monitoring missile launches to ensure treaty compliance, as well as providing early warning of missile attack. They can also be used to locate the launch sites of missiles used in combat operations.

4. Weather satellites

30. The civil usefulness of weather satellites is generally recognized. They also provide vital support to military operations both in peace and in war. The cost-free access to data from weather satellites has been a fine example of international cooperation in the peaceful uses of outer space throughout the

years and has proved to be fundamental in helping States develop better weather forecasting and in increasing natural disaster preparedness.

5. Nuclear explosion detection systems

31. Since the early 1960s satellites which are capable of detecting nuclear explosions on the Earth and in space have been deployed. Some of those satellites, along with weather and early warning satellites, carry several types of sensors to detect the location of nuclear explosions and to evaluate their yield. The information from these satellites could be also used for the purpose of planning military operations.

6. Communications satellites

32. Communication represents one of the most widespread applications of modern satellites. Communication satellites are important both for military and civil applications. These satellites may be classified into three categories, according to their orbital characteristics: they are geosynchronous, semi-synchronous or non-synchronous. They may also be classified by their operating frequencies, bandwidth or by the type of traffic and service provided. Most communication satellites are in the geostationary Earth orbit. Satellites are today a routine and vital element of the international telecommunication systems, as well as many national networks, and in specialized systems, such as the international COSPAS-SARSAT search and rescue system.

7. Navigation satellites

33. Navigation satellites were one of the earliest military applications of space technology, and are among the most useful to military forces on Earth. Military aircraft now use navigation satellites to guide them to aerial tankers for inflight refuelling as they fly non-stop from their home bases to conflicts thousands of miles away. They can also use navigation satellites to guide them to their targets with pinpoint precision, where they can drop their bombs with an accuracy that will rival that of much more expensive "smart" weapons.

8. Anti-satellite weapons

34. As the applications of military space systems have increased in importance over time for States with the most active space programmes, interest has grown in developing anti-satellite (ASAT) weapons to counter the contributions that a potential adversary's satellites might make to its combat effectiveness.

35. Any use of an anti-satellite weapon against an orbiting space object is feared to produce debris that in some cases could affect other space objects or may also fall over populated areas, with unpredictable consequences. This concern is more vivid vis-à-vis the environmental consequences of an uncontrolled re-entry in the atmosphere of the remains of a space object carrying a nuclear power source.

36. Early research into the development of an ASAT capability was initiated by the space Powers in the 1950s. The first successful ASAT intercept took place near Kwajalein Island in the Pacific Ocean in May 1963. A year later, nuclear-tipped ASATs became operational on Johnson Island. This programme, based on the Thor rocket, ended in 1976 and emphasis on research and development shifted to non-nuclear, kinetic-kill mechanisms. In the early 1980s, research focused on the developments of an air-launched hypersonic miniature homing vehicle, but the programme was frozen in 1988. Research continues on a ground-based kinetic-kill interceptor based on a solid fuel missile system.

37. Parallel in time to the project, which involved the Kwajalein Island testing, research was undertaken to develop a co-orbital interceptor designed to place a multi-ton satellite in low Earth orbit. The theory was that, by manoeuvring close to a satellite target and co-orbiting with it, an explosive charge could be detonated, which would shower the target with shrapnel. Satellites which are delicate, it was reasoned, could be readily destroyed by this method. Testing between 1968 to 1982 had limited success (approximately 70 per cent as mentioned in some publications) when using a radar homing device and much less when a heat-seeking homing device was used. The entire system was cumbersome and limited in employment. Although of marginal effectiveness, it was declared operational. The system has not been tested since 1982.

38. Work has also been carried out on the use of directed energy systems for ASAT missions. Various types of ground-based high-energy lasers, if sufficiently focused and coupled with highly accurate tracking, might be able to damage satellites in orbit as they pass overhead.

39. It should be noted that much of the work on these ASAT systems has now become of lower priority, or has been terminated. This reflects the more cooperative relationship between the two States with the most active space programmes.

40. In summary, it appears that research specifically related to developing ASAT technology has been inconclusive and sporadic, although interest in the concept resurfaces from time to time. Aspects of this concept continue to be a subject of considerable controversy.

9. Anti-missile weapons

41. Anti-missile weapons involved in defending against offensive strategic missiles are relevant to this study to the degree that they represent a potential residual ASAT capability, are based in space, or employ space-based components.

42. Any satellite that passes through the limited attack zone of an anti-missile weapon would probably be as vulnerable to attack as would any strategic missile or warhead passing through that zone. In most instances, only satellites in low-orbit would be subject to such theoretical vulnerabilities.

43. It should be noted, however, that accurate high-energy lasers, space-based interceptors, and long-range anti-missiles systems could all contribute to extending the zone of vulnerability of satellites to anti-missile systems.

44. While space-based anti-missile weapons have been under serious study, not all of the technical challenges associated with such weapons have been solved. At present, there are no known programmes to deploy systems involving such weapons.

B. Emerging trends

45. Outer space continues to assume a growing importance both for military and civilian activities, as discussed earlier in the section. The importance is illustrated, inter alia, by: (a) a growing number of countries exploring ways to use outer space; (b) military uses spreading from strategic to tactical purposes or missions; (c) communications technology for civilian purposes operating at higher powers and in new frequency bands; and (d) an increasing commonality of use of outer space between commercial and military applications. Although since the end of the cold war some aspects of military use of outer space by some powers has been reconsidered, research in this field is continued by the leading space countries.

1. Other States space capabilities

46. A number of other States have or are planning to develop national space capabilities. While at present most of these national programmes or plans do not envision a military component, military capabilities could be built upon those programmes. Increased transparency in space programmes, including these programmes, would be an important factor in building confidence among States.

47. In implementing the recommendations of UNISPACE II, and on the recommendation of COPUOS, the United Nations Secretary-General, on the basis of United Nations General Assembly resolution 46/45 of 9 December 1991, requested Member States to submit annual reports on their space activities. The annual reports submitted by States were reproduced in the report of the Secretary-General submitted to the General Assembly at its forty-seventh session (A/47/383). Taking into account that report, the Assembly again requested the Secretary-General, under resolution 47/67 of 14 December 1992, to report to it at its forty-eighth session on the implementation of the recommendations of the Conference. Those requests pertaining to reporting on national space activities and on the implementation of recommendations of UNISPACE appear as regular items in the United Nations General Assembly annual resolutions on peaceful uses of outer space.

48. Describing the national programmes of individual States is beyond the mandate of this Study Group. Most of these activities are carried out for purposes such as telecommunications, meteorology, research and remote sensing of the Earth and other activities. 5/ It is worth noting that Member States of the European Space Agency (ESA) had decided to "Europeanize" a greater part of their national space programmes by integrating them into Agency programmes. 6/

2. Increasing numbers and capabilities

49. During the 1980s, there was an expansion in the number and sophistication of military satellites. In addition to an increase in optical imaging capabilities, new radar imaging satellites were introduced that provide high resolution coverage under all weather and lighting conditions.

50. Just as armed forces are increasingly more dependent on satellites, those satellites are used more and more in a coordinated manner; for instance, information from weather satellites might help programming for cloud-free observation, or navigation satellites because of their precision can assist in accurate determination of satellite in-orbit location and control. 7/

3. Dual use systems

51. Space technologies are to a large extent of dual use in their application, as to a lesser degree are the systems. While the technologies employed may be similar or identical, the purpose for which they are employed - military or civil - is normally identifiable, albeit sometimes with some difficulty. The military may also contract with commercial corporations in a manner similar to other customers when it appears cost-effective to do so and where their security and availability requirements can be met.

52. Roles likely to be exclusively military include imaging satellites employed as national technical means (NTM) for intelligent purposes as well as SIGINT and ELINT collectors. Their primary purpose is the collection of other types of military and strategic intelligence. They have a potential, as well, to locate targets for attack. These are more likely to be strategic than tactical targets. Early warning satellites can be used in the interest of ballistic missile defences, specifically providing information on the launching of ballistic missiles. Nevertheless many of these satellites, particularly imaging satellites, contribute significantly to the function of arms control verification. Commercial imaging systems are closing the technology gap in terms of resolution, and therefore may contribute significantly in increasing future transparency on a global basis. They do not yet have the capability to contribute to arms control verification in other than a support role in determining presence of major infrastructures and monitor possible environmental degradations.

53. There are a number of areas, low altitude weather satellites for example, that are based on nearly equal civil and military capabilities. Physically quite similar and often made by the same company, the military often make use of both systems. Discrete military and civilian low altitude navigational satellite systems are deployed. The military use of full Global Positioning System (GPS) capabilities, however, remain unavailable to civilian users. The military mapping community is a leading customer for commercially available remote sensing data and high resolution remote sensing film products, which are apparently derived from satellites whose primary mission was initially military map-making, is now becoming available to the commercial sector.

54. It is clear that a considerable potential now exists to make use of data gathered by military or commercial means on a broader basis. Clearly, in the post bi-polar world of space technology, cooperative efforts must be developed. Data collected should be utilized in an organized manner and on a global basis.

4. Combat applications

55. The increased integration of military space capabilities with terrestrial military planning and that of space systems with each other have resulted in the expanding role of space and military space systems. One recent example of this was the Operation Desert Shield and Desert Storm where United States satellites for imaging, signals intelligence, early warning, weather, communications and navigation were extensively used. 8/

III. EXISTING LEGAL FRAMEWORK: AGREEMENTS AND DECLARATIONS OF PRINCIPLES

56. Since the beginning of the space era, several international instruments concerning both military and peaceful aspects of the exploration and uses of outer space have been concluded.

57. The existing treaties concerning activities of States in outer space could be divided into three categories: global multilateral agreements (see appendix III), regional multilateral agreements and bilateral agreements. In addition, the General Assembly of the United Nations has adopted a number of resolutions containing declarations of principles concerning the space activities of States.

58. An attempt to identify several confidence-building components in some of these treaties is made in table 2.

A. Global multilateral agreements

1. Outer Space Treaty

59. The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty) 9/ established the principles governing peaceful activities of States in outer space. According to article I, the exploration and use of outer space, including the Moon and other celestial bodies, shall be (a) "carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind"; (b) "shall be free for exploration and use by all States without discrimination of any kind, on the basis of equality and in accordance with international law"; and (c) "there shall be freedom of scientific investigation, ... and States shall facilitate and encourage international cooperation in such investigations". Further, activities of States Parties to this Treaty shall be carried out "in accordance with international law, including the United Nations Charter, in the interest of maintaining international peace and security and promoting international cooperation and understanding" (art. III). In article IV, paragraph 1, the States Parties undertake, inter alia, not to place "in orbit around the Earth any object carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner". The Treaty further provides that the Moon and other celestial bodies shall be used exclusively for peaceful purposes, and forbids "the establishment of military bases, installations and fortifications, the testing of any kind of weapons and the conduct of military manoeuvres on celestial bodies" (art. IV, para. 2).

TABLE 2

CBMsIN SOME MULTILATERAL AND BILATERAL ARMS LIMITATION AND DISARMAMENT AGREEMENTS

(a) MULTILATERAL AGREEMENTS RELATED TO OUTER SPACE a/			
Name of Agreement	Place and date of signature Entry into force	Duration Number of States Parties	What confidence-building measures does it have?
PTBT	Moscow 5 August 1963 10 October 1963	Unlimited Right to withdrawal 119 States Parties	No verification clauses; but NTMs have been routinely used for verification purposes.
Outer Space Treaty	London, Moscow, Washington 27 January 1967 10 October 1967	Unlimited Right to withdrawal 93 States Parties	Opportunity to observe the flight of space objects; on-site inspection on the Moon and other Celestial Bodies; consultations if an activity is potentially harmful to those of others; an obligation to inform the United Nations Secretary-General of the nature, conduct, locations and results of their activities in outer space; the Secretary-General should be prepared to disseminate such information immediately and effectively; stipulates that all installations, equipment and space vehicles shall be open to representatives of other States Parties, on condition of reciprocity.
Rescue Agreement	New York 22 April 1968 3 December 1968	Unspecified Right to withdrawal 69 States Parties	Specifies an obligation to notify the launching authority in case of accident; notify the United Nations Secretary-General about it; the Secretary-General shall disseminate the information received.
Liability Convention	New York 29 March 1972 1 September 1972	Unspecified Right to withdrawal 35 States Parties	Questions arising from damage are solved through a Claim Commission.
Registration Convention	New York 14 January 1975 15 September 1976	Unspecified Right to withdrawal 37 States Parties	Stipulates the framework for reporting to the United Nations Secretary-General information regarding name of launching State; appropriate designator; date and location of the launching of objects in space; basic orbital parameters, general function; changes in orbital parameters after launch, recovery date of the spacecraft.

Name of Agreement	Place and date of signature Entry into force	Duration Number of States Parties	What confidence-building measures does it have?
ITU Convention	Geneva December 1992 Enters into force on 1 July 1994	Unlimited Right to withdrawal 128 States Parties	The Union maintains and extends international cooperation among all members for the improvement and rational use of telecommunications of all kinds; coordinates efforts to eliminate harmful interference between radio stations of different countries; fosters international cooperation in the delivery of technical assistance to the developing countries, etc.
ENMOD Convention	New York 18 May 1977 5 October 1978	Unspecified Right to withdrawal 57 States Parties	Consultation and cooperation among parties in solving problems concerning the implementation of the Convention; a Consultative Committee of Experts may undertake to make appropriate finding of facts and provide expert views relevant to any problem raised; in case of a breach of obligations, any State Party may lodge a complaint with the Security Council.
Moon Agreement	New York 18 December 1979 11 July 1984	Unlimited Right to withdrawal 8 States Parties	Requires informing the United Nations Secretary-General of activities concerned with the exploration and use of the Moon; the required information should include: the time, purposes, locations, orbital parameters and duration of each mission to the Moon; shall inform the Secretary-General of any phenomenon they discovered in outer space, including the Moon; information on manned or unmanned stations on the Moon; on-site inspection by all parties; consultation in case a State Party believed unfulfilment of obligations, and if such consultation does not result in settlement, any party may seek the assistance of the United Nations Secretary-General.

Note: The extracts regarding confidence-building measures are for illustrative not interpretative purposes. They do not represent a judgement or endorsement by the Group of Experts. Readers are advised to refer to the original documents for additional detail.

/...

(b) BILATERAL AGREEMENTS RELATED TO OUTER SPACE			
Name of Agreement	Place and date of signature Entry into force	Duration Number of States Parties	What confidence-building measures does it have?
Nuclear Accident Agreement	Washington 30 September 1971 30 September 1971	Unlimited USSR, USA	Mutual notification in case of accidental incident involving a risk of outbreak of nuclear war; establishment of Direct Communication Link; consultations to consider questions relating to implementation of the Agreement.
Hot Line Agreement	Washington 30 September 1971 30 September 1971	Unspecified USSR, USA	Provides the establishment of a satellite communication system to increase reliability of the Direct Communication Link.
ABM Agreement	Moscow 26 May 1972 3 October 1972	Unlimited Right to withdrawal USSR, USA	Provides for verification measures by National Technical Means (NTMs), as well as establishing the principle of non-interference with NTMs; establishment of a Standing Consultative Commission to consider question concerning compliance.
SALT-I	Moscow 26 May 1972 3 October 1972	Five years (Expired in 1977) USSR, USA	Provisions similar to those in the ABM Treaty.
TTBT	Moscow 3 July 1974 11 December 1990	Five years Right to withdrawal USSR, USA	Similar to those in the ABM Treaty and SALT-I.
PNET	Moscow 28 May 1976 11 December 1990	Five years, with possibility of extension USSR, USA	NTMs; allows access to sites of explosions; establishes Joint Consultative Commission for information necessary for verification.
SALT-II	Vienna 18 June 1979 Has never entered into force	Five years USSR, USA	NTMs; voluntary data exchange within the framework of Standing Consultative Commission.

Name of Agreement	Place and date of signature Entry into force	Duration Number of States Parties	What confidence-building measures does it have?
Nuclear Risk Reduction Centres	Washington 15 September 1987 15 September 1987	Unlimited Right to withdrawal USSR, USA	Protocol I provides for notification of ballistic missile launches under Article 4 of the 1971 Nuclear Accident Agreement, and under paragraph 1 of Article 6 of the 1972 Prevention of Incidents on and over High Seas Agreement; Protocol II provides for the establishment and maintenance of facsimile communications between each party's Nuclear Risk centres (an INTELSAT satellite circuit and a STATSIONAR satellite circuit).
INF Treaty	Washington 8 December 1987 1 June 1988	Unlimited Right to withdrawal USSR, USA	Provides for verification measures by NTMs; paragraph 2, subparagraph (a) confirms the principle of non-interference with NTMs; provides intrusive on-site inspections.
Notification of Launches	Moscow 31 May 1988 31 May 1990	Unlimited Right to withdrawal USSR, USA	Provides for notification, not less than twenty-four hours in advance, of planned date, launch area, and area of impact for any launch of an ICBM or SLBM; including the geographic coordinates of the planned impact area or areas of the RVs.
Prevention of Dangerous Military Activities	Moscow 2 June 1989 1 January 1990	Unspecified Right to withdrawal USSR, USA	Stipulates an obligation of the Parties to notify use of a laser; establishes and maintains communications as provided in its annex I; establishes a Joint Military Commission to consider questions of compliance with obligations.
START-T b/	Moscow 31 July 1991 Has not entered into force	15 years Right to withdrawal USSR, USA	Provides for extensive on-site inspections and continuous monitoring activities; use of NTMs of verification; confirms the principle of non-interference with such means; rights and obligations concerning notification of different activities are elaborated in a Notification Protocol; establishes a Joint Compliance and Inspection Commission, etc.
START-II	Moscow 3 January 1993 Has not entered into force	As long as START-I Right to withdrawal FR, USA	Provides that the provisions of the START Treaty shall be used for implementation of this Treaty; establishes a Bilateral Implementation Commission for resolving questions related to compliance with the obligations assumed, and to agree on additional measures to improve effectiveness of the Treaty.

a/ Number of States Parties as of 1 January 1993.

b/ The START-I Treaty was converted into a multilateral treaty by the signing of the Lisbon Protocol on 23 May 1992 by Belarus, Kazakhstan, Russian Federation, Ukraine and the United States.

60. The Treaty regulates some other relevant questions, such as international responsibility (art. VI), international liability for damage due to such activities (art. VII), the question of jurisdiction, control and ownership over launched objects (art. VIII), cooperation among the States Parties, consultations in case of potentially harmful interference with activities of other States Parties (art. IX); there is an opportunity to observe the flight of space objects launched by other States (art. X); and "all stations, installations, equipment and space vehicles on Moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on the basis of reciprocity" (art. XII). The text of the Treaty is reproduced in appendix I.

2. Other global multilateral agreements

61. (a) The first global multilateral treaty regulating military activities of States in outer space is the 1963 Treaty on Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (PTBT). 10/ Under article I of the Treaty, the States Parties have undertaken "to prohibit, to prevent, and not to carry out any nuclear weapons test explosions, or any other nuclear explosion, at any place under its jurisdiction or control" in the atmosphere; beyond its limits, including outer space; or under water, or any other environment. The Treaty does not provide a verification mechanism and it is left to the States Parties to do so by their own national technical means (NTMs).

62. (b) The 1967 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 11/ stipulates obligations of the States Parties in case that "the personnel of a spacecraft have suffered accident, or experiencing conditions of distress or have made an emergency or unintended landing" in territory of another State, and that they shall (a) "notify the launching authority or, if it cannot identify and immediately communicate with the launching authority, immediately make a public announcement by all appropriate means of communication at its disposal;" and (b) "notify the Secretary-General of the United Nations, who should disseminate the information without delay by all appropriate means of communication at his disposal" (art. 1). The remaining provisions regulate in details the obligations of the "launching authority" and the obligations and rights of the other contracting Parties involved in such accidents, as well as further obligations of the Parties to notify the Secretary-General of the United Nations on steps undertaken regarding their search and rescue operations.

63. (c) The 1971 Convention on International Liability for Damage Caused by Space Objects 12/ provides that "a launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft flight" (art. II). The remaining articles elaborate the obligations and rights of States Parties in the event of damage, such as the procedure to claim compensation, including the establishment of a claim commission, liability of international organizations which conduct space activities, etc.

64. (d) Under the 1975 Convention on Registration of Objects Launched into Outer Space, 13/ States Parties undertake an obligation that they shall, when a space object is launched into Earth orbit or beyond, register such objects in an

appropriate register and inform the Secretary-General of the United Nations of the establishment of such a register (art. II). The Secretary-General shall maintain a Register in which the information furnished in accordance with article II shall be recorded. Article IV enumerates the information that shall be furnished by each State of registry, such as name of the launching State or States; an appropriate designator of the space object; date and territory or location of launch; basic orbital parameters, and general function of the space object. For more details, see chapter VII of this study.

65. (e) The basic instruments of the International Telecommunication Union (ITU) are the Constitution and the Convention as adopted in 1992 and complemented by the Radio Regulations and the Final Acts of the World Administrative Radio Conferences. The main role of the Union is to allocate bands of the radio frequency spectrum, to allot radio frequencies and any associated orbital positions on the geostationary orbit. In addition, each satellite operator, irrespective of the mission of the satellite, has to notify the International Frequency Registration Board (IFRB) of its plans, thus ensuring an optimal functioning as well as avoiding harmful interference. 14/

66. (f) The 1978 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques 15/ (ENMOD Convention) prohibits military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party (art. I) and defines these techniques as those changing - through deliberate manipulation of natural processes - the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space (art. II). The States Parties have undertaken "to consult each another and to cooperate in solving problems which may arise in relation to the objectives of, or in the application of the provisions of, the Convention"; such consultations and cooperation may also be undertaken through appropriate international procedures within the framework of the United Nations and in accordance with its Charter, as well as of a Consultative Committee of experts as provided for in paragraph 2 of article V (art. V, para. 1). The composition and the procedure of the work of the Consultative Committee of Experts are elaborated in an annex to the Convention. In addition, Understandings Regarding the Convention (related to arts. I, II, III and VIII) are relevant for the interpretation of the Convention. 16/

67. (g) The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 17/ has further elaborated the principles established under the Outer Space Treaty concerning States' activities on the Moon and other celestial bodies. The Moon shall be used exclusively for peaceful purposes and the Agreement prohibits any threat or use of force or any hostile act or threat of hostile act on it. It also confirms the obligations of States not to place in orbit around or other trajectory to or around the Moon objects carrying nuclear weapons or any other weapons of mass destruction, nor to establish military bases, installations and fortifications. The Moon Agreement also requires that "States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of their activities concerned with the exploration and use of the Moon". The required information shall include the time, purposes, locations, orbital parameters and duration of each mission to

the Moon as soon as possible after launching, while information on the results of each mission, upon its completion (art. 5, para. 1). In addition, the States Parties "shall inform the Secretary-General, as well as the public and the international scientific community, of any phenomenon they discover in outer space, including the Moon, which could endanger human life or health, as well as of any indication of organic life" (art. 5, para. 2). Under article 9, "States Parties may establish manned and unmanned stations on the Moon. A State Party establishing a station shall use only that area which is required for the needs of the station and shall immediately inform the Secretary-General of the United Nations of the location and purposes of that station. Subsequently, at annual intervals that State shall likewise inform the Secretary-General whether the station continues in use and whether its purposes have changed."

B. Bilateral treaties

68. (a) The 1972 Anti-Ballistic Missile Treaty (ABM Treaty), 18/ signed between the USSR and the United States, is of unlimited duration, and is of special significance to the study. The objective of the Treaty is to limit ABM systems and their components designed to intercept strategic ballistic missiles or their warheads in flight. This includes ABM launchers, interceptors, and radars constructed and developed for an ABM role or tested in an ABM mode. Article 1 sets forth the basic principle of the Treaty, namely to limit the deployment of ABM systems to agreed levels and regions. The Treaty bans the development, testing, and deployment of ABM systems and/or their components that are sea-based, mobile land-based, air-based, and, the most important in the context of the study, space-based (art. 5).

69. Apart from weapon limitation, the ABM Treaty is also relevant to the study because of the norms it has established on the use of NTMs for verification purposes. This is the first agreement (along with the SALT I agreement) to refer to verification by these means, as may be seen from article 12, paragraph 1, which codifies national means of verification and specifies that they shall be carried out in a manner consistent with generally recognized principles of international law. Here the concept of non-interference with NTMs (art. 12, para. 2) is also important since NTMs include ground and space-based systems. This concept also implicitly includes the protection of such space-based systems as reconnaissance satellites (art. 12, para. 3) and thus protection against any form of interference. Legitimacy was therefore given by the Parties to the Treaty to their satellite activities for monitoring arms limitation and disarmament agreements. In addition, to promote the objectives and implementation of the provisions of the Treaty, a Standing Consultative Commission is established, within the framework of which the Parties will consider, inter alia, questions concerning compliance with the obligations assumed; provide on voluntary basis such information as either Party considers necessary to assure confidence in compliance with the obligations assumed; questions involving unintended interference with NTMs of verification, possible changes in the strategic situation that have a bearing on the provisions of the Treaty, etc.

70. (b) Non-interference with NTMs has also been stipulated in other USA/USSR agreements. Like the provisions of the ABM Treaty, the verification measures in the 1972 Strategic Arms Limitation Talks SALT I Agreement 19/ and the 1979

Strategic Arms Limitation Treaty SALT II 20/ are of special relevance to outer space. According to the provisions of article 9, paragrah 1 (c) of SALT II Treaty the development, testing or deployment of systems for placing into Earth orbits nuclear weapons or any other kind of weapons of mass destruction, including fractional orbital missiles, are prohibited. The 1991 START-I Treaty also provides that "each Party shall use national technical means of verification" (art. IX, para. 1); each is enjoined, too, "not to interfere with the national technical means of verification" (art. IX, para. 2). 21/ The 1993 START-II Treaty of 3 January 1993 between the Russian Federation and the United States provides that the verification provisions of START-I Treaty shall be used for the implementation of this Treaty. 22/

71. (c) Some other bilateral instruments which, although they do not stipulate arms limitation or disarmament measures, have some relevance to the study should be mentioned here. One is the 1971 USA/USSR Agreement to Reduce the Risk or Outbreak of Nuclear War. 23/ Under this Agreement, each Party undertakes to notify the other in the event of an accidental or unauthorized incident that might cause a nuclear war. In article 4, the notification requirement includes advance notice of planned launches in the case that any such launches extend beyond the national territory of the launching Party and in the direction of the other Party. However, it is article 3 that is more directly relevant to the context of the study, since the Parties of that Treaty legitimized the existence and the use of certain satellite systems for military purposes.

72. (d) These two aspects of the 1971 Agreement were further codified in another bilateral instrument signed on the same day - namely, the 1971 Agreement on Measures to Improve the USA-USSR Direct Communication Link. 24/ The advances in satellite communications technology that had occurred since 1963 25/ offered the possibility of greater reliability than the arrangements originally agreed upon. The Agreement, with its annex detailing the specifics of operation, equipment, and allocation of costs, provides for the establishment of two satellite communications circuits between the USA and the USSR, with a system of multiple terminals in each country. The United States is to provide one circuit via the Intelsat system, and the Soviet Union a circuit via its Molniya II system. In addition, each Party shall be responsible for providing to the other Party notification of any proposed modification or replacement of the communication satellite system containing the circuit provided by it that might require accommodation by Earth stations using that system or that might otherwise affect the maintenance of the Direct Line Communication Link.

73. (e) With the view to supplement earlier measures of communication at the Government-to-Government level, the 1987 USA/USSR Nuclear Risk Reduction Centres Agreement 26/ and its Protocols I and II, further codify the use of satellite communication in the interest of mutual security. Communication between the two countries is based on direct satellite links. These links are used for the exchange of information and for notifications as required under certain existing and possible future arms control and confidence-building agreements. Protocol I, article 1, calls for notification of ballistic missile launches under article 4 of the 1971 Nuclear Accident Agreement and under paragraph 1 of article 6 of the 1972 Prevention of Incidents on and Over High Sea Agreement. To achieve this, Protocol II, article 1, stipulates the establishment and maintenance of an INTELSAT satellite circuit and a STATSIONAR satellite circuit

to provide facsimile communication among each Party's national Nuclear Risk Centres.

74. (f) Two other bilateral agreements with some bearing on the subject of the study are the 1988 Agreement on Notification of Launches of Intercontinental Ballistic Missiles and Submarine-launched Ballistic Missiles 27/ and the 1989 Prevencion of Dangerous Military Activities Agreement. 28/ Article 1 of the 1988 Agreement stipulates that each Party shall provide notification, no less than 24 hours in advance, of the planned date, launch area, and area of impact for any launch of a strategic ballistic missile (ICBM or SLBM), as well as the geographic coordinates of the planned impact area or areas of the reentry vehicles. The Parties further agree to hold consultations, as mutually agreed, to consider questions relating to implementation of the provisions of the Agreement. In the 1989 Agreement, words and terms such as lasers and interference with command and control networks are defined. This Agreement also codifies the use of lasers in peacetime. Article 2 stipulates, for example, that each Party shall take the necessary measures directed towards preventing the use of "a laser in such a manner that its radiation could cause harm to personnel or damage to equipment of the armed forces of the other Party". There is also an obligation of the Parties to notify each other in case of such use of a laser (art. IV, para. 2). Further, for the purpose of preventing dangerous military activities, as well as expeditiously resolving any incident, the Parties shall establish and maintain communications as provided in annex 1 to this Agreement (art. VII). In addition, a Joint Military Commission is established to consider questions of compliance with the obligations assumed under the Agreement (art. IX).

75. A number of bilateral and regional treaties were concluded among different States containing provisions concerning space-related matters.

C. United Nations General Assembly resolutions on declarations of principles

76. On recommendation of COPUOS, the General Assembly has adopted a number of sets of principles governing the space activities of States: the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (1963); the Principles Governing the Use of Artificial Earth Satellites for International Direct Television Broadcasting (1982); the Principles Relating to Remote Sensing of the Earth from Space (1986); and the Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992).

77. (a) On 13 December 1963, the United Nations General Assembly adopted resolution 1962 (XVIII) containing the Declaration of Legal Principles Governing the Activities of States in the Exploration and the Use of Outer Space. 29/ On the basis of the principles contained in the Declaration, a number of multilateral agreements were negotiated and concluded under the auspices of the United Nations (as indicated in sections A and B above). The Declaration provides, inter alia, that "If a State has reason to believe that an outer space activity or experiment planned by it or its nationals would cause potentially harmful interference with activities of other States in the peaceful exploration and use of outer space, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State

which has reason to believe that an outer space activity or experiment planned by another State would cause potentially harmful interference with activities in the peaceful exploration and use of outer space may request consultation concerning the activity or experiment" (Principle 6).

78. (b) On 10 December 1982, the General Assembly adopted resolution 37/92 containing the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting. 30/ It provides, inter alia, that "activities in the field of international direct television broadcasting by satellite should be carried out in a manner compatible with the sovereign rights of States" (Principle 1); and "in a manner compatible with the development of mutual understanding and the strengthening of friendly relations and cooperation among all States and peoples in the interest of maintaining international peace and security" (Principle 3).

79. (c) On 3 December 1986, the United Nations General Assembly adopted resolution 41/65 containing Principles Relating to Remote Sensing of the Earth from Space. 31/ These Principles provide, inter alia, that remote sensing activities "shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed State" (Principle IV) and that "a State carrying out a programme of remote sensing shall inform the Secretary-General of the United Nations" and shall "make available any other relevant information to the greatest extent feasible and practicable to any other State, particularly any developing country that is affected by the programme, at its request" (Principle IX).

80. (d) On 14 December 1992, the United Nations General Assembly adopted resolution 47/68 containing the Principles Relevant to the Use of Nuclear Power Sources in Outer Space. 32/ The Principles define guidelines and criteria for the safe use of nuclear power sources. They provide, inter alia, that the results of safety assessment of nuclear power sources carried out by a launching State "shall be made publicly available prior to each launch, and the Secretary-General of the United Nations shall be informed on how States may obtain such results of the safety assessment as soon as possible prior to each launch" (Principle 4). Also, the launching State operating "a space object with nuclear power sources on board shall in a timely fashion inform States concerned in the event this space object is malfunctioning with a risk of re-entry of radioactive materials on the Earth"; such information shall be also transmitted to the Secretary-General of the United Nations "so that the international community will be informed of the situation and will have sufficient time to plan for any national response activities deemed necessary" (Principle 5).

IV. GENERAL CONSIDERATION OF THE CONCEPT OF CONFIDENCE-BUILDING MEASURES

81. Confidence-building measures are increasingly accepted as an important element in reducing suspicion and tension between nations and enhancing international peace and stability. Over the past three decades, States have initiated a growing number of bilateral and multilateral confidence-building measures. This rich history of experience can provide the basis for an evaluation of the potential contribution of confidence-building in the space arena. A review of this history reveals a number of common characteristics of such measures, as well as guidelines for their applicability to particular circumstances. Thus several criteria can be identified for considering the implementation of confidence-building measures in outer space.

82. Confidence-building measures have also played an increasing role in the security planning of States. While initially limited to bilateral arrangements pertaining to strategic nuclear weapons, they have more recently found application in a multilateral context relating to conventional military forces. A clear pattern emerges of initial measures reducing the risk of misperception leading to the further development of more elaborate measures building on this positive experience.

83. The United Nations system has given increasing attention to the potential contribution of confidence-building measures to strengthening international peace and stability. The positive experience that has emerged in a bilateral context and in certain regions has formed a basis for the potential extension of this process to other areas and subjects.

84. At its First Special Session devoted to disarmament in June 1978, the General Assembly noted in paragraph 93 of the Final Document of the session that:

"In order to facilitate the process of disarmament, it is necessary to take measures and pursue policies to strengthen international peace and security and to build confidence among States. Commitment to confidence-building measures could significantly contribute to preparing for further progress in disarmament." 33/

85. At its thirty-third regular session, the General Assembly adopted resolution 33/91 B on 16 December 1978, calling on all States to consider regional arrangements for confidence-building and to inform the Secretary General on views and experience on appropriate and feasible confidence-building measures.

86. Based on these replies, the General Assembly approved resolution 34/87 B on 11 December 1979, calling for the preparation of a comprehensive study of confidence-building measures. The group of 14 governmental experts appointed to carry out this study, adopted its report by consensus on 14 August 1981. The study represented the first attempt to clarify and develop the concept of confidence-building measures in a global context. The experts expressed the hope that the report would provide guidelines and advice to Governments that intended to introduce and implement confidence-building measures. They also hoped to promote public awareness of the importance of such measures for the

maintenance of international peace and security, as well as for developing and fostering a process of confidence-building in various regions. 34/

87. At its thirty-sixth regular session, the General Assembly adopted resolution 36/97 F of 9 December 1982, by which it reaffirmed the importance of confidence-building measures and invited all States to consider regional arrangements for confidence building. It also called for the submission of the Comprehensive Study on Confidence-Building Measures to the General Assembly at its second special session devoted to disarmament.

88. At its thirty-seventh regular session, the General Assembly adopted resolution 37/100 D, by which it requested the Disarmament Commission to consider the elaboration of guidelines for appropriate types of confidence-building measures and for the implementation of such measures on a global or regional level. The Guidelines 35/ were finally adopted by the Commission on 18 May 1988 and endorsed by the General Assembly in its resolution 43/78 H. The Guidelines are reproduced in appendix II to this study.

89. Confidence-building measures have been acknowledged and advocated by the United Nations as a means for dispelling mistrust and stabilizing situations of tension, thus contributing to create a favourable climate for the conclusion of effective disarmament and arms limitation measures.

90. On the basis of the Comprehensive Study on Confidence-Building Measures, the Guidelines adopted by the United Nations Disarmament Commission and other existing agreements, the following common characteristics and criteria for their implementation and applicability are discussed.

A. Characteristics

91. The process of confidence-building emerges from the belief in the cooperative predisposition of other States. Confidence increases over time as the conduct of States indicates their willingness to engage in cooperative behaviour.

92. The process of building confidence between States evolves through step-by-step reductions and even elimination of the causes of mistrust, fear, misunderstanding and miscalculation with regard to relevant military and/or dual-use capabilities of other States, as well as their other security-related activities. This process is premised on the recognition of States' need for reassurance that certain military or security-related activities of other States do not threaten their own security.

93. The effectiveness of confidence-building measures depends on the extent to which they directly respond to the specific perceptions of uncertainty or threat in a particular situation or environment. Thus specific measures must be tailored to specific circumstances.

94. The confidence-building process must strike a balance between bilateral and multilateral applications. Regional examples may not find global applications, but such measures should have a global context with specific regional considerations.

95. Improved confidence is based primarily on practical military policy carried out by States and on concrete actions that express a political commitment whose significance can be examined, verified and assessed. The development of certainty evolves from experience with the conduct of States in specific situations. Thus proclamations of generally accepted principles of international behaviour, declarations of intent, or pledges of future behaviour are welcomed, but may not be sufficient for reducing suspicion or perceptions of threat.

96. A higher degree of confidence can be achieved only when the amount of information that States command enables them to predict satisfactorily and to calculate the actions and reactions of other States within their political environment. The level of such predictability increases the degree of openness and transparency with which States are prepared to conduct their political and military affairs.

97. The openness, predictability and reliability of the policies of States are essential for the maintenance and strengthening of confidence. Agreements on specific confidence-building measures can help to allay suspicions and to engender trust by creating the framework for a wide range of contacts and exchanges. Prejudices and misconceptions, which are the basis for mistrust and fear, can be alleviated through expanded personal contacts at levels of decision-making.

98. Reductions in perceptions of threat or conditions of uncertainty are most effectively achieved through the consistent, continuous, and complete implementation of accepted confidence-building measures. The reliability, seriousness and credibility of the commitment of States to the process of reducing mistrust is demonstrated through their dependable implementation of such measures.

99. Confidence-building is a process whereby the accumulation of greater experience of positive interactions forms the basis for greater trust and thereby for further measures of confidence-building. This is a dynamic process, accelerating over time.

100. Thus, this process usually proceeds from general commitments of a less restraining nature to more specific commitments, eventually leading to the progressive elaboration of a comprehensive network of measures enhancing the security of States.

(a) One means of developing confidence is to enhance the quality and quantity of information exchanged on military activities and capabilities.

(b) Another means of furthering the development of trust and predictability involves the expansion of the scope of confidence-building measures.

(c) Another means of strengthening confidence-building is increasing the degree of commitment to the process. Voluntary unilateral measures should be reciprocated, leading to mutually established political commitments, thence to measures that may subsequently be developed into legally binding obligations.

101. Confidence-building measures have primarily political and psychological effects and, although closely related, cannot always be considered as arms limitation measures by themselves in the sense of limiting or reducing armed forces. Rather, improved confidence can have a positive impact on the subjective estimation of the intentions and expectations of other States.

102. Confidence-building measures can contribute to progress in concrete disarmament and arms limitation agreements. They can supplement disarmament and arms limitation agreements, and thus can become an important avenue for progress in reducing international tensions. In the context of disarmament and arms limitation negotiations, such measures may form part of an agreement itself, facilitating implementation and verification provisions.

103. Confidence-building measures cannot substitute for concrete progress in limiting and reducing armaments. In the face of unconstrained increases in the number of weapons, or of continued improvements in the capabilities of weapons, the distrust and apprehension that is created will outweigh the contribution of confidence-building initiatives.

B. Criteria

104. The effective implementation of confidence-building measures requires careful analysis in order to determine with a high degree of clarity those factors that will support or undermine confidence in specific situations.

105. Accurate assessment of the implementation of agreed measures is fundamental to contribute fully to the development of predictability and trust. Thus it is essential that the details of agreed confidence-building measures should be defined with as much precision and detail as possible.

106. Thus the process of confidence-building requires clear criteria by which States' behaviour may be judged. These criteria are necessary both so that States may guide their own activities and so that States may evaluate the activities of others. The development of confidence proceeds from the extent to which States' behaviour is consistent with such accepted and established criteria.

107. The requirement for clarity also implies that accepted criteria will be readily verified by interested and affected parties. Verification procedures in and of themselves can contribute to the building of confidence.

108. The initiation of confidence-building measures requires the consensus of participating States. It is the product of the political will of States, in a free exercise of sovereignty, to accept practical measures to implement legitimate and universal principles of international conduct. This decision involves commitments as to which measures are to be implemented and the form of the implementation. Observation of the principles of sovereign equality and undiminished and balanced security are essential conditions for those States participating in the confidence-building process.

109. Specific confidence-building measures must be applicable to specific military capabilities and relevant to the particular technological

characteristics of military systems. The measures must take into account those aspects of military technologies and systems which are most relevant to the security concerns of interested and affected States. Similarly, confidence-building measures must take into account the unique characteristics of the geographical and physical environment in which they are to be implemented.

C. Applicability

110. Confidence-building measures are applicable to three categories of States: (a) those that are direct participants in activities that may be the source of mistrust or tension; (b) other States that are affected by military or security policies of those in the first category; and (c) those States that are involved in encouraging further development of the confidence-building process.

111. Confidence-building measures differ according to whether they constitute positive responsibilities or negative constraints. They also differ as to whether the obligation involves an exchange of information or a constraint on activities.

112. Such measures have been divided into three broad categories, according to the activities to which they are applied:

(a) Encouraged activities are those that promote the peaceful uses of space for all human-kind, such as scientific exploration and discovery. These also include measures by which States demonstrate that their intentions and capabilities are not hostile or aggressive. Such measures, which may be implemented on a continuing basis, involve exchanges of information and personnel, including data on force levels and characteristics;

(b) Permitted activities encompass the full range of those not explicitly prohibited, though not specifically encouraged. They include measures that reduce the apprehensions States may have concerning the combat potentials of particular military activities. In particular, measures which are intended to reduce concerns about surprise attack may include notification of military behaviour and related activities;

(c) Prohibited activities are those forbidden by various elements of the present international legal regime, such as the placement of weapons of mass destruction in space. Measures that strengthen these prohibitions include those that seek to limit or prohibit the scope or nature of certain classes of activities, either under particular circumstances or in general. These measures differ from traditional disarmament and arms limitation measures in that it is the activity of forces, rather than the capabilities or potentials of the forces, that are limited or prohibited.

113. There are other categories of activities, too, whose prohibition will build confidence. These are:

- Activities that have not yet taken place and are not currently contemplated, confirming existing norms of behaviour and extending these norms into the future.

- Activities that might otherwise take place in a particular region or environment, including activities in particularly sensitive areas such as border regions.

- Activities that would only be conducted at a stage of deteriorating political or military relations.

114. Such measures may place limitations on some military options, but they cannot replace more concrete arms control and disarmament measures which would directly limit and reduce military capabilities.

V. SPECIFIC ASPECTS OF CONFIDENCE-BUILDING MEASURES IN OUTER SPACE

115. The extension of universal principles of confidence-building measures to outer space must take into account the unique characteristics of the space environment and space technology. Bilateral and regional experience to date with confidence-building initiatives may contribute to the elaboration of further initiatives.

116. There are a number of aspects of the space environment that distinguish it from other environments in which confidence-building measures have previously been implemented.

A. Specific features of the space environment

117. Outer space is both distant and nearby. It is distant because it is difficult to access, and because the extent of even stratospheric space dwarfs terrestrial dimensions. It is nearby in that no State is more than a relatively short distance from outer space, which lies only a few hundred kilometres above every nation.

118. Outer space is simultaneously a uniquely harsh environment and one that is uniquely benign. The vacuum of space is fatal to unprotected humans and presents novel challenges for experimentation as well as the basic operation of objects in space. Similarly, hazards are posed by the radiation in space, which far exceeds that of Earth. In addition, natural meteoroids and debris from human space activities create dangers to equipment and living creatures that have little parallel on Earth. The spacecraft must protect both itself and its occupants (if any) from the low temperatures of the Earth's shadow or of deep space, as well as from the high temperatures produced by high-power operations in full sunlight. Yet space is also a uniquely benign environment. Once in orbit, free of the extreme stresses of launch and air-drag, spacecraft may deploy enormous and delicate structures that would quickly collapse if erected on the Earth's surface or released at high velocities through the atmosphere.

119. A rocket takes only a few minutes to take a spacecraft from the Earth's surface to low Earth orbit. Once there, a satellite moves at more than 25,000 kilometres each hour, circling the globe up to 16 times a day and providing a unique vehicle for observations of Earth. Further, a spacecraft in orbit above the atmospheric drag regime, will continue unimpeded on its gravitation- and radiation-appointed trajectory for years, even decades.

120. These environmental characteristics present unique technological problems to those who wish to reach and utilize the space environment. The technical difficulties and financial burdens of entering and operating in space challenge even the most technically advanced and wealthiest countries and far exceed the capacity and resources of most States.

121. Consequently, countries may be divided according to their space capabilities into at least three categories. So far only two nations, the United States and the Russian Federation, possess the full range of small and

large launch vehicles, piloted and unmanned spacecraft, and military and civilian space proficiencies that are currently attainable.

122. A growing number of other States possess some but not all of these capabilities, typically launching capacities and competence in the design, manufacturing and operation of satellites for research and other applications. The vast majority of countries that remain are not space Powers of this order and derive their benefits from the exploitation of space only through the capabilities of others.

123. At the same time, the number of countries that participate directly or indirectly in activities in space has steadily increased since 1957, as have their capabilities. There is every reason to expect these trends to continue in the decades to come.

124. The Group notes the view of some States that there is a need to adjust certain aspects of the present space market as soon as possible, especially in the new global political climate.

125. Confidence-building proposals have focused largely on measures intended to reduce concerns about surprise attack or inadvertent war. One fundamental issue in applying confidence-building to outer space is precisely what security issues posed by space activities and technology are to be addressed.

126. This calls for understanding the relative value of space-related confidence-building measures and cooperation in space projects. Space cooperation itself can strengthen international confidence and may be considered a confidence-building measure.

127. Confidence-building measures can respond to the intrusive character of outer space activities. Access to space gives space-faring nations access to all points on Earth for a wide variety of civilian and military applications. This intrusive capability, even where it does not involve weapons, can generate mistrust. Thus, confidence-building measures could function to provide assurances that outer space activity is not being used against non-space countries. Greater openness in military and other space activities may be a positive development not only in the military sphere, but in the economic and social spheres as well.

128. From another perspective, one of the future threats to stability may be not only military space systems generally, but space weapons in particular. The implications of developing new military systems designed to be deployed in space should be studied further.

129. The application of confidence-building measures to space activities is affected by a variety of other factors, too. The verification of compliance is an essential component of confidence-building. Space presents both challenges and opportunities for verification. The vast distances of space, and the sophisticated technologies of space systems can make verification complex. At the same time, space is the most transparent of environments, open in all directions, and the technologies lend themselves to verification. Since some space systems may be used for both civilian and military purposes, differentiating between the two is not always easy.

B. Political and legal

130. The political basis for confidence-building in space derives from the application of universal principles of international cooperation and State practice to the outer space environment.

131. The prevention of an arms race in outer space is one of the specific objectives of the efforts to elaborate confidence-building measures in outer space. Other objectives, however, may also be relevant to this process.

132. Such other objectives arise from the concerns of different groups of States and are based primarily on the possibility of having access to space, the implementation of technology transfers to enable such access, and matters of regional and global stability. The growing dependence of the national and international communities on space technology for economic and social purposes increases the necessity for all activities in space to take place in a safe environment. These concerns derive from the great differences in capabilities among differing categories of States.

133. In the past, the outer space activities of the major space Powers appeared to be predicated, in part at least, on the strategic objectives that each of these nations seemed to pursue in terms of their bilateral strategic relationship. Since the ABM Treaty negotiations of the early 1970s to the most recent Defense and Space Talks (the last rounds of which took place in October 1991), emphasis on their bilateral strategic relationship was obvious. With the significant changes in this bilateral relationship since 1989, some of the activities of each in the space environment particularly for military purposes, appear to have been reframed and restrained, at least in part by considerations related to cost, technological capacity and existing legal constraints.

134. Another important consideration in this regard is the fact that the number of nations with growing capacities in fields related to outer space is increasing. This has global as well as regional implications and its significance for the use of outer space from a strategic, economic or environmental perspective remain to be seen.

135. Whether the new space Powers will be mainly interested in scientific and other civilian activities rather than military applications, like the current leading space Powers also remains an open question. The answer may depend in part on the extent of international cooperation in space, as well as the nature of their strategic interests.

136. The non-space Powers want assurances that the major space Powers will not use their space capabilities against non-space countries in any way. In addition, these States are concerned that space be used exclusively for peaceful purposes.

137. The Outer Space Treaty and the other treaties dealt with in chapter III include some measures that may be considered confidence-building components. There are currently two points of view in terms of the legal regime: first, that the existing legal regime represents a framework of confidence-building

measures in outer space that calls for continuous review; second, that the existing legal regime is not sufficient and should be examined further. In the latter case, the elaboration of confidence-building measures in outer space would facilitate the application of existing treaties.

138. Whether confidence-building measures in outer space could be a subject of a separate treaty or that of a special instrument remains to be determined. In any case, there is still a need for a more precise definition of legal terms and the development of some others to fulfil the requirements of the political situation on the one hand, and on the other, technological and scientific developments in outer space.

C. Technological and scientific

139. The technological implications of confidence-building measures in outer space are twofold. They concern those technologies that can be used in support of confidence-building in space and those that can be used for confidence-building from space.

140. Some confidence-building activities in space may require a range of technologies that can be used both to monitor space activities and to enhance the transparency of space operations. At present, while some space activities are the subject of international agreements, such as the advance publication and notification procedures for all satellite stations pursuant to International Telecommunication Union regulations, many space activities are not covered by specific international agreements.

141. Confidence-building from space can be enhanced by various systems that can monitor terrestrial military activities in support of both existing and prospective confidence-building measures and disarmament and arms limitation regimes.

142. Many space systems have inherent dual capabilities: they have the potential to perform both military and civilian functions. The technology used to launch satellites is similar in many aspects to that used for long-range ballistic missiles. Satellites used for monitoring natural resources can also provide images of interest to military planners, while communications, weather, and many other types of satellites are useful for both military and civilian purposes.

143. The multiple applications of space technology have several specific consequences. Some space operations, including but not limited to military operations, produce artificial debris in space that can become a danger to other satellites. In addition, nuclear-power sources may be required for some types of space missions, both military and civilian. Compliance with the information clauses contained in General Assembly resolution 47/68 could allay anxieties concerning the safety of using such devices in outer space. Although a complete ban on such power sources may not be acceptable, the provision of more information, as well as greater openness may be needed to alleviate security concerns.

1. Technology and outer space

144. Technological considerations provide a number of opportunities for the implementation of confidence-building measures in space, while also placing a number of practical limitations on space operations. The technological considerations pertain to both the nature of activities in space, as well as to the means of observing these activities.

145. Activities in space may be divided into several phases, such as launch, transfer orbits, deployments, check-out, and operations. Before becoming operational, the full classification of a specific satellite in terms of its final function may be difficult. However, while operating in orbit, satellites generally exhibit characteristics that are unique to spacecraft performing a particular function. Consequently this function at least can usually be identified. Communications satellites will relay radio-frequency transmissions with specific power, frequency coverage and polarization characteristics. Satellites used for meteorological and optically based resource monitoring functions, as well as those used for imaging intelligence and early warning of missile launches, will all use optical systems with apertures of various sizes, and transmit large quantities of data when sensing. Radar satellites, both civilian and military, will deploy large transmitting and receiving antennas that emit distinctive radio-frequency signals, coupled with high-speed data. Electronic intelligence satellites may deploy distinctive receiving antennas. Finally, all types of satellites transmit to ground stations distinguishing telemetry patterns.

(a) Technology for monitoring space operations

146. Since 1957, the United States and the Soviet Union have deployed a wide range of systems for monitoring space activities. 36/ One mission of these systems has been to provide warnings of strategic missile attacks. But the growing number of satellites in orbit has increased the necessity of keeping track both of new launches and the impending decays of satellites so as to avoid confusing these events with hostile missile launches. In addition, the increasing scope of military space operations has made the tracking and characterization of space systems a significant mission in its own right.

147. Satellite tracking systems, both optical and radar, are among the most sophisticated and expensive military sensor technologies. Spacetrack radars typically have ranges and sensitivities 10-100 times greater than radars for tracking aircraft or surface targets. Moreover, optical tracking systems use telescopes that rival all but the largest civilian astronomical observatories.

(b) Ground-based passive optical systems

148. The earliest form of satellite tracking systems, still the least expensive, rely on sunlight reflected off a spacecraft. Visible against the pre-dawn or post-dusk sky, the largest low orbiting spacecraft, such as space stations or imaging intelligence satellites, are comparable to the brighter stars in the sky, while many other low-orbiting satellites are visible to the naked eye. 37/ Even satellites at geosynchronous altitudes are visible with relatively modest optics under optimal lighting conditions. 38/

149. The capability of a telescope to observe satellites is primarily a function of the aperture of its primary optical surface, as well as the properties of the means used to form the image. Telescopes with mirrors up to four metres in diameter have been used for satellite tracking. Initially, satellite tracking cameras used film systems; more recently, electronic charge-coupled devices (CCDs) have replaced them. CCDs provide an instantaneous read-out of the image, avoiding the time-consuming processing required by film systems. These electronic cameras, coupled with image-processing devices, have enabled scientific telescopes of modest apertures of a few metres to obtain recognizable images of large spacecraft in low orbits. 39/

(c) Ground-based active optical systems

150. Although most optical sensors rely on reflected sunlight or emitted infrared energy for satellite tracking, active optical sensors are finding increasingly application. By illuminating a target with coherent laser radiation, these systems can image satellites that are not illuminated by sunlight at night, as well as targets that may be obscured by sky-glow during daylight hours. The use of active illumination also permits direct measurement of the range of the target, as well as facilitating the characterization of the satellite's structure.

(d) Ground-based radars

151. Ground-based radar systems have been used since the late 1950s to track civilian and military satellites. 40/ Radars have several advantages over optical tracking systems, including the ability to observe targets and to measure their range in all weather and independently of natural illumination. Today the United States and the Commonwealth of Independent States both deploy extensive networks of radars that perform the satellite tracking function, as well as other tasks, such as the detection of missile attacks.

152. As radar technology has advanced, the problem has taken on a new dimension. Today's modern and sophisticated large-phased array radars (LPARs) can serve many functions. They can provide early warning of missile or bomber attacks. LPARs can track satellites and other objects in space and observe missile tests to obtain information for monitoring purposes. They are also an essential component of present generation ABM systems, providing initial warning of an attack and battle management support, distinguishing reentry vehicles from decoys, and guiding interceptors to their targets.

(e) Other technical means of monitoring space characteristics

153. Although these various information collection systems - many of which have been constructed for other purposes - can enhance the transparency of space operations, some military space activities may require the application of special techniques developed to provide adequate confidence concerning their precise nature.

154. The presence of nuclear-power sources and many space weapons on satellites could be determined by pre-launch inspections of all satellite payloads.

(f) Monitoring space weapons

155. Three criteria are applicable to the consideration of systems for monitoring space weapons. First, the technical collection systems required to enhance transparency, as well as other means to this end, should be available during the time-frame in which activities of concern are likely to occur.

156. Second, the cost of monitoring may be a major obstacle to verification. Schemes that require vast expenditure and produce much data of little interest are unlikely to generate adequate support.

157. Third, technical collection systems should not be so powerful that they reproduce the anti-missile systems that they may be intended to limit. Verification schemes that require inspection satellites to rendezvous with other satellites in order to determine the presence or absence of prohibited activities may be difficult to distinguish from prohibited anti-satellite systems. Similarly, large space-based infrared telescope sensors used for verification may be difficult to distinguish from sensors that would form the basis for an ABM battle management system.

158. The performance of a laser (its "brightness") is a function of the aperture of its mirror and the power and wavelength of the laser beam. While the mirror aperture can be monitored by a variety of means, it is not clear that the technology currently available can check more than the main operational beam. Machinery adequate to monitoring the power and wavelength of lasers may not be available for another decade.

159. For example, the development and deployment of entirely new specialized space-based sensors for monitoring factors such as laser brightness may require as much as 10 years after a decision to produce such a device. Given this situation, cooperative measures such as in-country monitoring stations might be considered, since they could be deployed much sooner.

160. Civilian and military satellites are all placed in orbit by launch vehicles that can be observed by early warning satellites. Launching facilities and activities are monitored by imaging satellites. All orbiting satellites can be tracked by a variety of ground based radars and cameras.

161. ASAT and related tests against a point in space without benefit of a target would not provide adequate assurance in tests for the error-free accuracy required by kinetic energy impact kill mechanisms. The intercept manoeuvres of kinetic energy interceptors are distinguishable from the activities of other satellites. Further, telemetry streams from satellites are subject to monitoring by space-based sensors. Consequently, because of their unique testing requirements, kinetic energy weapons could be readily monitored by various means.

2. Technology and confidence-building measures

162. While space systems may be a subject of monitoring and confidence-building, they can also contribute to this process. Satellites can be used to monitor other satellites, as well as terrestrial developments. While this latter

application is one of the missions for the imaging and other intelligence satellites discussed earlier, there have also been proposals for developing satellites specifically for this purpose. For some countries, transparency concerning space launching capabilities is now a significant issue.

(a) PAXSAT-A

163. The Canadian PAXSAT-A concept, developed in 1987-1988, was the outcome of a feasibility study on the ability of a specialized spacecraft to provide information on other spacecraft, while the PAXSAT-B concept (discussed below) was intended to monitor ground activities from space. 41/

164. PAXSAT-A concerns verifying the stationing of weapons in space, which requires the determination of the function and purpose of a satellite using non-intrusive means. These sensors would function in a complementary fashion, for example, combining an image of a satellite's radar antenna with data on the operating wavelength of the radar, thus providing an indication of the satellite's resolution and ground coverage. The mass of the target satellite could be assessed by knowledge of the thruster aperture combined with radar observations of the satellite's accelerations after thruster firings of measured duration, which would be monitored by the infrared sensor.

165. The PAXSAT-A constellation might initially consist of two operational satellites plus one spare in high-inclination orbits at altitudes of 500-2,000 kilometres. Subsequently, another satellite might be launched into semi-synchronous orbit, with another placed into geosynchronous orbit.

(b) Satellites for monitoring terrestrial activities

166. Imaging and other intelligence satellites have made a significant contribution to arms limitation. Thus far, however, satellites used for arms limitation verification have served this function as an adjunct to their primary mission of collecting strategic and tactical military intelligence. None the less, there have been several proposals for satellites that would be deployed specifically for arms limitation verification. Such satellites could make a positive contribution to regional and global confidence-building initiatives within given institutional arrangements.

(c) International Satellite Monitoring Agency (ISMA)

167. In 1978, at the First Special Session of the General Assembly devoted to disarmament, France submitted a proposal calling for the establishment of an International Satellite Monitoring Agency (ISMA) for the international verification of disarmament and arms limitation agreements, as well as for monitoring crisis situations. 42/ This proposal led to a study by a Group of Experts on the implications of setting up such an agency. 43/

168. The implementation of the ISMA concept was expected to proceed in three phases:

(a) In Phase I, an Image Processing and Interpretation Center (IPIC) would be established using imagery from existing civilian and other national satellites for training and exploitation;

(b) In Phase II, a network of 10 specialized ground stations would be devoted to receiving data from civilian and non-civilian satellites;

(c) In Phase III three specialized ISMA spacecraft would be launched and operated.

169. The initial phase of this proposal was subsequently proposed by France at the third special session devoted to disarmament in June 1988, entitled Satellite Image Processing Agency (SIPA). 44/ The principal function of the Agency would correspond to the initial phase of ISMA, the gathering and processing of data emanating from existing civilian satellites and the dissemination of the resulting analysis to Member States. This could contribute to verification of existing disarmament and arms limitation agreements, establishing facts prior to the conclusion of new agreements, monitoring crisis situations and disengagement agreements, as well as preventing and handling disasters and major natural hazards. The Agency could serve as a centre for the training of photo-interpretation experts, as well as a research centre for the further development of these applications.

(d) International Space Monitoring Agency (ISpMA)

170. At the third special session of the General Assembly devoted to disarmament in 1988, the Soviet Union proposed the establishment of an International Space Monitoring Agency (ISpMA), 45/ which would provide the international community with information relating to compliance with multilateral arrangements for disarmament and the reduction of international tension and would also monitor the military situation in areas of conflict. In the opinion of the Soviet Union, placing the results of monitoring by national satellite systems at the disposal of an international organization would be a major step towards promoting confidence and openness in relations between States.

171. In addition to its military policy aspects, the activities of ISpMA could interest many States by supplying them with satellite data important to their economic development.

172. ISpMA might be assigned the following functions:

(a) Collection of information from space monitoring;

(b) Consideration of requests from the United Nations and individual States for a study of information services that could prove useful to them in evaluating compliance with international arrangements and agreements concerning local wars and crisis situations;

(c) Elaboration of recommendations on procedures for the use of space facilities for monitoring or verification of future treaties and agreements.

173. The ISpMA concept can be successfully implemented by moving forward in stages and establishing a sound political, legal and technical basis for the implementation of subsequent steps.

(a) At the first stage a Space Image Processing and International Centre would be created as the main technical organ of ISpMA. In view of the

heterogeneity of data coming from national space monitoring sources, it is particularly important to have a universal facility to convert data from various sources into an integrated geographical information system for subsequent processing and analysis. Obligations to provide such a facility might be assumed by Member States that possess the necessary resources, financial or technological, for creating it;

(b) At the second stage of ISpMA's activities, a network of ground data-reception points would be created to receive data through channels operating in near-real time from Member States that have space monitoring facilities. 46/

(e) PAXSAT-B

174. The PAXSAT-B spacecraft grew out of a feasibility study by Canada of space technologies specifically geared to verifying treaties based on the control of conventional forces over a limited region, such as the European theatre. 47/ It was assumed that it would operate in the political and military context previously outlined for PAXSAT-A. The PAXSAT-B was required to provide data based on two scenarios:

(a) The more critical was the detection of a violation breakout and involved satellite access to any point in the region within 36 hours.

(b) The less critical was surveying the entire treaty area over a period of 30-40 days.

175. Given the meteorological conditions of the European region, this meant that the satellite had to carry an all-weather imaging radar sensor, which was expected to have some capability for penetrating rudimentary camouflage countermeasures.

VI. CONFIDENCE-BUILDING MEASURES IN OUTER SPACE

A. The need for confidence-building measures in outer space

176. The potential importance of confidence-building measures in outer space derives both from concerns over emerging trends in space activities, as well as from the need to prevent an arms race in outer space.

177. A number of security concerns have been voiced by various States about current and potential directions of military space activities. Some of these are interrelated and such concerns may apply at both global and regional levels.

178. These concerns among States are not only related to the militarization of outer space, but also particularly to the "weaponization" of outer space. At present there are no weapons deployed in space, and most of the world community wants to be sure that such systems will not appear in future. One source of these concerns lies basically in the areas of ballistic missile defence (BMD) and anti-satellite (ASAT) systems. These systems could threaten satellites in orbit, including those playing an important role in maintaining strategic stability.

179. A second concern is based on the increasing application of military space systems to support terrestrial combat operations, and the significant disparities in such capabilities of modern weapon systems. Military satellites are of increasing relevance to the contemporary battlefield.

180. Another concern derives from the proliferation of missile technology in the world. While recognizing the legitimate right of States to acquire space-launch capability for peaceful purposes, many States believe that such capability might be used for military applications. The latter could include space activities that might be considered hostile to other States.

181. The most significant concern arises from all those mentioned above, namely, that the peaceful uses of the space environment may become increasingly constrained by military considerations. Thus far, space missions have coexisted largely with relatively little mutual interaction. But future growth in military space programmes might result in diminished opportunities for international cooperation in peaceful uses of outer space.

182. Currently, however, there is no agreement as to whether the existing international regime applicable to outer space is adequate. While the importance of this regime has been recognized, uncertainties remain. Thus some Parties to the Outer Space Treaty of 1967 maintain that the Treaty places no constraints on military activities in the Earth's orbit other than the placement of nuclear weapons or other weapons of mass destruction. Other Parties to the Treaty contend that the Treaty's mandate that space be used for peaceful purposes precludes the application of space systems to combat support functions.

183. As indicated earlier in chapter IV, at least three categories of space activities are envisioned under the present international legal regime for outer space. Activities that are prohibited by various elements of the legal regime, such as, for example, the placement of weapons of mass destruction in space. Activities that are encouraged are those that promote the peaceful uses of space

for the benefit of all humankind, such as scientific exploration and discovery. Activities that are permitted encompass the full range of those not explicitly prohibited, though not specifically encouraged. While these broad distinctions may have been adequate in the early years of the space age, it is not clear that they provide sufficient guidance for the decades ahead. Enlarged space capabilities and the enlarged community of nations that are actively participating in the utilization of the space environment may require a further elaboration of international norms of behaviour.

184. The progressive expansion of the range of space activities and the increasing number of space-faring nations justify the progressive development of new international norms for space activities. Given the time required to complete the negotiation of any potential additional multilateral treaties governing space activities, a range of confidence-building measures could make a positive contribution to this process.

B. Proposals for specific confidence-building measures in outer space

185. Over the past decades a wide range of measures have been proposed by various States to address the issue of the prevention of an arms race in outer space. As early as 1957, in the Subcommittee of the Disarmament Commission, Canada, France, the United Kingdom and the United States called for a technical study of the features of an inspection system to ensure that the launching of objects through outer space was conducted exclusively for peaceful and scientific purposes. 48/

186. Some of the proposals advanced over the past decade are directly concerned with arms limitation and prohibitions on space weapons and related activities. A number of other suggestions have been advanced relating to confidence-building measures in this field. Some arms limitation initiatives, too, contain elements that provide enhanced transparency of activities, and thus are also of interest in the present context.

Overview of proposals 49/

187. A schematic overview of proposals concerning confidence-building measures (CBMs) advanced over the past decade is presented in table 3. These proposals generally fall into a number of categories, including:

(a) Those intended to increase the transparency of space operations generally;

(b) Those intended specifically to increase the range of information concerning satellites in orbit;

(c) Those that would establish rules of behaviour governing space operations;

(d) Those that pertain to the international transfer of space and rocket technology.

Table 3

Confidence-building proposals discussed in the Ad Hoc Committee for the Prevention of an Arms Race in Outer Space

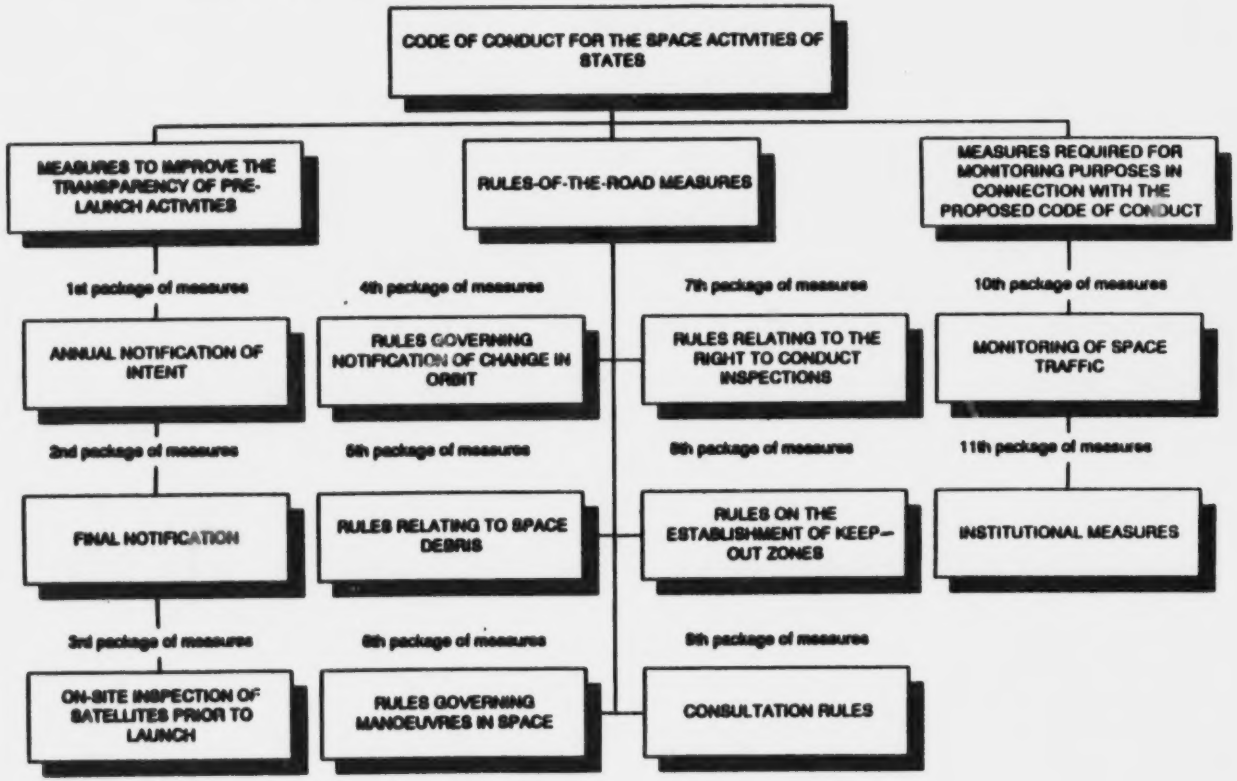
A. Confidence-building measures

Nature of measures	Major objective	Measures	Means
Voluntary/reciprocal (1989)	Transparency in international law of outer space and activities in that environment	Indicate States' understanding of and adherence to relevant treaty obligations Sharing of information regarding their current and prospective activities in outer space	Dissemination of information through: Diplomatic channels in the CD The Secretary-General of the CD
Contractual obligation			
Code of Conduct and Rules of the Road/Rules of Behaviour	International law: Improving existing legal norms aimed at transparency Outer space and activities: Establishing a set of norms to guide States' behaviour in respect of their own and/or others' activities in outer space Reducing the risk of accidental collisions, preventing incidents, preventing close-range co-orbital pursuits, and ensuring better knowledge of outer space traffic	Provision of regular updating, in the event of manoeuvres or drifting, of orbital elements declared at the time of registration The keeping of a minimal distance between any two satellites placed in the same orbit (in order to avoid not only accidental collisions, but also short-range co-orbital tracking, which is a precondition for the system of space mines) Monitoring of close-range passing (to limit risks of collision or interference	Broadening of the Registration Convention relating to information on launches scheduled by States Establishment of a procedure providing for requests for explanations in the event of incidents/suspicious acts Identification of keep-out zones in the form of two spherical zones moving with each satellite: (1) a proximity zone to delimit the location of each space object in reciprocal orbit, as well as the capability of each object to move with respect to the others, and (2) a wider approach zone, with obligatory notification for passage through it
International Launch-Notification Centre	Notification of ballistic missile and space launcher launches	The establishment of an international centre under the auspices of the United Nations	Launch data collection and analysis

Nature of measures	Major objective	Measures	Means
International Trajectography Centre (1989)	Collect data for updating registration Monitor space objects Conduct real time calculation of space objects' trajectories	The establishment of an international trajectography centre and Consultation Machinery	Data provided by each State concerning its own satellites or the satellites it has detected. Constant upgrade information on orbits and manoeuvres
Satellite Image Processing Agency (1989)	Collect data to facilitate the verification of disarmament agreements, and to serve as a clearing-house for the exchange of data, the establishment of certain facts, such as force estimates, in advance of the conclusion of disarmament agreements Monitoring of compliance with disengagement agreements (local conflicts) Prevention/handling of natural disasters/development programmes	Establishment of a low-cost Agency assigned to conduct data-processing, management, analysis, and dissemination operations	The collection and processing of data obtained from existing civilian satellites, and then to disseminate this material to the Agency's members

Source: UNIDIR study entitled Access to Outer Space Technologies: Implications for International Security UNIDIR/92/77 (United Nations publication, Sales No. GV.92.0.30), p. 100.

B. Confidence- and security-building measures concerning a Code of Conduct for the Space Activities of States


CODE OF CONDUCT FOR THE SPACE ACTIVITIES OF STATES
MEASURES TO IMPROVE THE TRANSPARENCY OF PRE-LAUNCH ACTIVITIES
RULES-OF-THE-ROAD MEASURES
MEASURES REQUIRED FOR MONITORING PURPOSES IN CONNECTION WITH THE PROPOSED CODE OF CONDUCT
1st package of measures
ANNUAL NOTIFICATION OF INTENT
2nd package of measures
FINAL NOTIFICATION
3rd package of measures
ON-SITE INSPECTION OF SATELLITES PRIOR TO LAUNCH
4th package of measures
RULES GOVERNING NOTIFICATION OF CHANGE IN ORBIT
5th package of measures
RULES RELATING TO SPACE DEBRIS
6th package of measures
RULES GOVERNING MANOEUVRES IN SPACE
7th package of measures
RULES RELATING TO THE RIGHT TO CONDUCT INSPECTIONS
8th package of measures
RULES ON THE ESTABLISHMENT OF KEEP-OUT ZONES
9th package of measures
CONSULTATION RULES
10th package of measures
MONITORING OF SPACE TRAFFIC
11th package of measures
INSTITUTIONAL MEASURES

Source: Reproduction from document CD/OS/WP.58 (based on proposals by States members of the Ad Hoc Committee on the Prevention of an Arms Race in Outer Space).

C. Possible institutional arrangements

Feature	ISMA France 1978	WSO USSR 1985	PAXSAT A Canada 1986	ISI Soviet Union 1988	ISpM Soviet Union 1988	UNITRAS France 1989	SIPA France 1989	INC France 1993
Type	Proposal	Proposal	Concept	Proposal	Proposal	Proposal	Proposal	Proposal
Scope	Global: existing and future treaties (unlimited number of treaties covering any type of weapon and weapons system)	Global: to promote global cooperation in outer space development	Treaty specific on the PAROS (unlimited number of treaties)	Specific treaty on the PAROS: prohibiting the placement of weapons of any kind in outer space	Global: existing and future treaties (unlimited number of treaties covering any type of weapon and weapons systems)	Global: all States possessing or using satellites; future agreements	Global: Agency's members	Global: new international instrument on regime of prior notification of space launches and ballistic missiles
Objective	Monitoring; verification (under special arrangements)	Cooperation in communication, navigation, rescue of people, weather forecasting service etc.	Verification (under special arrangements)	Verification	Monitoring: verification (under special arrangements)	Monitoring of the trajectory of Earth-orbiting devices	Collect and process data obtained by existing civilian satellite; To serve as research centre; To train national personnel to interpret space images	Strengthening cooperation and transparency in outer space
Application - monitoring and/or verification (as applicable)	Arms limitation and disarmament; RIOs dealing with security issues; Settlement of disputes	Coordination of different peaceful uses of outer space	Arms limitation and disarmament	Arms limitation and disarmament	Arms limitation and disarmament; RIOs dealing with security issues; Confidence-building measures; Settlement of disputes; Natural disasters; Other emergencies	Confidence-building; provide proof of good faith in the event of alleged deliberate collision	Confidence-building and security-building; Monitoring of compliance with disengagement agreements in local conflicts	Notification, CBMs, transparency

Feature	ISMA France	WSO USSR	PAXSAT A Canada	ISI Soviet Union	ISpM Soviet Union	UNITRAS France	SIPA France	INC France
Method	Remote sensing (space-to-Earth) 1978	Remote probing of the Earth by geophysical methods and by means of unmanned interplanetary spacecraft 1965	Remote sensing (space-to-space) 1986	On-site 1988	Remote sensing (space-to-Earth) 1988	Data collection through States' satellites; high-performance tracking and computer devices 1989	Data collection through ground sensors and satellite-borne detectors 1989	Receiving information; establishing databank; providing information 1993
Function	NTMs; ISMA satellites	Communication, rescue of people, study and preservation of the Earth's biosphere; developing of new sources of energy etc.	PAXSAT satellites (NTMs of contracting parties may contribute some data)	Permanent inspection teams; Ad hoc inspection teams	NTMs; Possibility of ISMA satellites	Collects data for updating registrations; monitoring space objects; conduct real time calculation of space objects' trajectories	Processing of remote maintenance data; data quality control; manned techniques of photo interpretation and computer-assisted interpretation	Supply information: using detection capabilities of States on voluntary basis
Output	Supply of satellite monitoring/ verification data	Disseminate scientific and technological data	Supply of satellite verification data	Treaty specific verification	Supply of satellite monitoring/ verification data	Provide data to be stored, not published	Disseminate restricted or unrestricted data	Supply through data bank information

Source: UNIDIR study entitled Prevention of an Arms Race in Outer Space, UNIDIR/86/08 (United Nations publication, Sales No. GV.86.0.2), p. 137 and documents CD/PV.377, CD/937 and CD/OS/WP.59.6

/...

188. Coverage of all existing, official and non-official proposals goes beyond the need of the present study. Therefore the overview of proposals that follows will be confined to those submitted to various disarmament forums, including the Conference on Disarmament, the United Nations Disarmament Commission and the United Nations General Assembly's First Committee, as well as to some bilateral proposals put forward within the framework of the negotiations between the United States and the Soviet Union, among others. According to a UNIDIR study, 50/ those proposals fall in the categories set forth in the following paragraphs.

1. Confidence-building measures on a voluntary and reciprocal basis

189. Agreements could be reached on certain arrangements that would not, initially, be intended to constitute a treaty. Any such agreement would take the form of non-mandatory provisions that States would observe in a spirit of reciprocity. This type of approach, if agreed, would demonstrate cooperative behaviour and contribute to mutual confidence.

190. In a proposal of this kind, Pakistan suggested in 1986 that the Conference on Disarmament "should call upon the space powers to share information regarding their current and prospective activities in space and to indicate their understanding of and adherence to relevant treaty obligations". 51/

191. In 1989, Poland submitted a proposal whereby measures would be adopted by the Conference on Disarmament itself, to which participating States would submit information leading to transparency in outer space activities. 52/ These measures, which were not intended to be legal obligations, would include information on the following:

(a) Positive law of outer space - a reaffirmation of the importance of space law; a call on all States to act in conformity with space law; a call on all States not yet parties to agreements related to outer space to consider their accession to such international instruments; a suggestion to all States Parties to multilateral treaties and agreements related to outer space to accept the jurisdiction of the International Court of Justice in all disputes concerning interpretation and application of such instruments;

(b) Transparency in space activities - an exchange of information on a voluntary basis of their space activities such as: activities having military or military-related functions; prior notification of the launching of space objects; sending observers to the launching of space objects or to the preparation of or participation in other space activities, particularly those having military or military-related functions (in the spirit of reciprocity and goodwill); supplying other information considered useful for (i) building confidence and (ii) the reduction of misunderstanding;

(c) Destination of information - to other members of the Conference on Disarmament, either through usual diplomatic channels or through the Secretary-General of the Conference on Disarmament and open to all States.

192. Further measures proposed by Poland suggested that members of the Conference on Disarmament, particularly those with outer space capabilities,

should agree to recognize that increased voluntary transparency would reduce misunderstanding among States.

193. In 1991, France declared itself "... ready to give favourable consideration to a measure providing for assessment visits at launch site or orbital control site of a registered space object", made it clear that measures involving such visits should take place on a voluntary basis and, stated that "... only States which had agreed to such an inspection could be visited". 53/

2. Confidence-building measures on a contractual obligation basis

194. Confidence-building measures on contractual basis have been the subject of several different proposals. For example, in 1986, Pakistan expressed the view that such measures could include, inter alia: negotiations to reach an interim or partial agreement in view of an international treaty to supplement the ABM Treaty; a moratorium on the development, testing and deployment of ASAT weapons; and immunity for space objects. 54/

195. To the above-mentioned proposals could be added proposals such as those for the creation of an international space agency and/or an international trajectography centre.

(a) Space Code of Conduct and Rules of the Road

196. The two terms, Space Code of Conduct and Rules of the Road, have been used interchangeably in the discussions of the Conference on Disarmament about confidence-building measures. In its generic meaning, a Space Code of Conduct has been considered to consist of a set of norms to guide States' behaviour in respect of their own and/or others' activities. The Rules of the Road, sometimes referred to as Rules of Behaviour, however, represent either the reaching of agreements on such norms or the norms themselves. The Rules of the Road would therefore be part of the Space Code of Conduct.

197. France, for example, has advocated that the aim of a code of conduct "... is to guarantee the security of space activities while preventing the use of space for aggressive purposes". It has further stated that, "... what is most important is to be able at any time to distinguish an incident of fortuitous or accidental origin from the result of specific aggression. To that end, it is suggested that a set of rules of behaviour should be drawn up ...". 55/ Thus, both concepts would be employed as yardsticks in the establishment of measures to increase the safety of space objects and the predictability of space activities.

198. Germany 56/ has repeatedly advocated that negotiations on these two concepts be undertaken under the auspices of the Conference on Disarmament for a number of reasons. A Space Code of Conduct is seen by Germany as a mechanism to reduce misinterpretation of space activities and inadvertent collisions with other space objects. In its view, this would create more transparency in respect of accidents in outer space, as well as provide a means of consultation between States in any such eventualities.

199. Germany also suggested a number of subject areas from which specific rules could be created. These included a mutual renunciation of measures that would interfere with the operation of other States' space objects; the establishment of minimum distances between space objects; the imposition of speed limits on space objects that approach one another and on high-velocity fly-by and trailing; restrictions on very low altitude overflight by manned or unmanned spacecraft; stringent requirements for advanced notice of launch activities; the grant of the right of inspection or restrictions on it; and the establishment of Keep-out Zones. 57/

200. The various measures mentioned above have sometimes been referred to as a sort of traffic code for space objects.

201. Such measures were formally proposed by France in 1989 within the framework of its proposal on satellite immunity. 58/ However, the French proposal was not conceived as exclusive; it focused mainly on the development of rules of conduct for space vehicles to reduce the risk of accidental collisions, prevent incidents, prevent close-range co-orbital pursuit, and ensure better knowledge of space traffic as follows:

(a) Providing for regular updating, in the event of manoeuvres or drifting, of orbital elements declared at the time of registration;

(b) Keeping a minimum distance between any two satellites placed in the same orbit in order to avoid not only accidental collision, but also short-range co-orbital tracking, which is a precondition for the system of space mines;

(c) Monitoring close-range passing to limit risks of collision or interference.

202. In 1991, a French working paper 59/ suggested that these rules might be implemented by:

(a) A broadening of the Registration Convention relating to information on launches scheduled by States;

(b) A procedure providing for requests for explanations in the event of an incident or suspicious activity;

(c) The identification of keep-out zones in the form of two spherical zones moving with each satellite: a proximity zone to delimit the location of each space object in reciprocal orbit, as well as the capability of each object to move with respect to the others; a wider approach zone, with obligatory notification for passage through it.

(b) Open outer space

203. In addition to proposals made at the Conference on Disarmament, some delegations have advocated a wide range of confidence-building measures to foster transparency and safety in space activities as viable contributions to achieving mutual confidence. The concept of open outer space has been presented as one such approach and is aimed at building confidence on a step-by-step basis. It would mean reaching agreement on a measure such as providing for data

exchange and then gradually build up confidence to obtain agreement on a measure more directly concerned with arms limitation. The Soviet Union has suggested 60/ that this concept be examined by the Conference on Disarmament since, in its view, the most important measures related to the realization of the open outer space are: the strengthening of the 1975 Registration Convention; the elaboration of Rules of the Road or a Code of Conduct for space activities; the use of space-based monitoring devices in the interest of the international community; and the establishment of an international space inspectorate.

3. Proposals for institutional framework

204. There are several proposals suggesting the creation of different mechanisms for space activities, whose functioning could also contribute to enhancing and/or contributing to confidence-building in outer space activities.

(a) International Trajectography Centre (UNITRACE)

205. In July 1989, France proposed the creation of an international trajectography centre (UNITRACE), 61/ to be set up within the framework of an agreement on the immunity of satellites and possibly as part of the United Nations Secretariat. The membership of the Centre would be open, on a voluntary basis, to all States possessing or using satellites. Since its main objective would be clearly confined to the monitoring of the trajectory of Earth-orbiting devices, France suggested that the Centre could play a key role in building up confidence among States. The Centre's principal function would therefore be to collect data for updating registration, monitor space objects, and conduct real time calculation of space objects' trajectories. Moreover, to fulfil its functions properly, the Centre would also require constantly upgraded information on orbits and manoeuvres. While the French proposal acknowledged that the existence of such a database would lead to a higher level of transparency, it also recognized that the nature of this data-gathering was such that the protection of technological and military information would be a serious consideration.

(b) Satellite Image-Processing Agency (SIPA)

206. In 1989, France proposed the creation of a Satellite Image-Processing Agency (SIPA), 62/ which would constitute the initial phase of an international institution for satellite monitoring. However, the French initiative clearly stated that the proposed agency "... would be a confidence-building device and would not be intended to be the embryo of a verification system with universal competence attached to the United Nations". Instead, SIPA is to be understood as an agency to be created within the framework of confidence-building and security-building measures. It would be designed as a low-cost agency with three objectives. The first of these would be to collect and process data obtained from existing civilian satellites, and then to disseminate that material to the Agency's members. Its second objective would be to serve as a research unit or centre charged with (a) identifying groups of satellites which could contribute to the implementation of multilateral civil or military programmes, and (b) designing various possible linkage agreements. The third objective would be to train national personnel to interpret space images and

ascertain the extent to which the monitoring and verification of arms limitation and disarmament could be performed by means of satellites.

207. At the third special session of the United Nations General Assembly devoted to disarmament, held in 1988, the Soviet Union proposed the creation of an International Space Monitoring Agency (ISpMA), which was later elaborated in more detail in the Conference on Disarmament (for more details see chapter V). 63/ According to this proposal, the main function of the Agency would be to collect information about monitoring space; providing information to the United Nations and Governments that could be useful in controlling local conflicts and crisis situations; and consideration of recommendations concerning the use of space-monitoring for control of future agreements.

4. The international transfer of missiles and other sensitive technologies

208. Concerns about the proliferation of nuclear weapons and other weapons of mass destruction, as well as the proliferation of delivery systems for such weapons, particularly long-range ballistic missiles, has been one of the sources of interest in creating mechanisms for the international transfer of missiles and other sensitive technologies.

209. In 1987, a group of States, 64/ sharing concerns about the proliferation of certain missile systems capable of delivering weapons of mass destruction, agreed to a Missile Technology Control Regime (MTCR). The primary purpose of this regime is to limit the proliferation of certain missiles, as well as specified components and technologies. This regime is not based on a formal treaty. Rather, each party has taken appropriate unilateral measures to adopt and implement common guidelines. Since 1987, additional countries, including a number of developing countries with important missile or space programmes, have adopted the regime's guidelines or declared their support for the regime's objectives. 65/

210. The international supplier-control regime applied to the proliferation of ballistic and cruise missiles has been the subject of a number of suggestions.

211. In the context of MTCR, which has been developed to limit the proliferation of some types of missiles and missile technology, France has suggested that it:

> "... should only be a stage towards a more general agreement, one that is geographically more extensive, better controlled and applicable to all. The agreement would lay down rules promoting civilian cooperation in space, while removing the dangers of the diversion of technology for developing a military ballistic capability ... the aim would be to arrive at a situation where all States wishing to gain access to space for development purposes would cooperate in a framework guaranteeing security." 66/

212. In 1991, Argentina and Brazil proposed a set of guidelines for the international transfer of sensitive technology that addressed this issue. They noted that:

"To aim at universality, and to prove capable of generating really effective international controls, the regulation of the flows of sensitive technologies cannot fail to take account of the interest and need of a large number of States in enjoying access to those technologies for peaceful purposes. It seems fair to assume that the degree of adherence by the community of nations to rules intended to curb the use of sensitive technologies in weapons of mass destruction will be in proportion to the perception that such rules do not constitute an impediment, but rather an encouragement, to the dissemination of scientific and technological knowledge for peaceful purposes." 67/

213. The suggested guidelines included:

"Enhanced international cooperation in the areas of science and technology strengthens confidence among States.

"The existence of disparities of treatment in this area and the differing degrees of access to high technology may result in a deterioration of confidence among countries.

"Because sensitive technologies can be used both for peaceful purposes and for weapons of mass destruction, they cannot be defined as inherently harmful. It is the intent or purpose underlying their utilization that such technologies may or may not have security implications.

"A system of international controls over flows of sensitive technology products, services and know-how should be seen essentially as of a monitoring nature, and not as a mechanism for the restriction of legitimate transfers." 68/

214. This general approach is consistent with a number of other suggestions that have been made for revising the present international technology transfer regime in light of the new world political environment.

5. Proposals for confidence-building measures in outer space within bilateral USA-USSR negotiations

215. A broad range of transparency and predictability measures has been discussed in the bilateral Defence and Space Talks between the United States and the Soviet Union. 69/ These have included:

(a) Annual exchanges of data, meetings of experts, briefings, visits to laboratories, observations of tests, and ABM test satellite notifications;

(b) A proposal for "dual pilot implementation" with each side demonstrating its proposed predictability measures;

(c) A proposal to conclude a free-standing agreement covering those measures, independent of the status of negotiations on concrete limitations on anti-missile testing and deployment.

216. Concrete steps taken with respect to these initiatives include the visit in December 1989 by Soviet specialists to United States-directed energy facilities in California and New Mexico.

217. Although these measures were proposed in a bilateral context, it was suggested, in 1986, by Sri Lanka that they might usefully be extended to multilateral application: 70/

> "The 'open laboratories' offer of the United States delegation could be implemented in an Ad Hoc Committee of the Conference with information provided by all delegations ..."

218. Also, in 1988, Pakistan suggested that, in addition to providing detailed information in advance of a launch concerning the nature of the payload, that this information should be verified:

> "... at the launch site by an international agency ... such an institution could be set up for the purpose of verifying data concerning the function of space objects with a view to providing the international community with reliable information on activities in space, especially those of a military nature." 71/

219. At the Summit Meeting in June 1992 between the Presidents of the United States and of the Russian Federation, it was stated in a joint statement issued on a Global Protection System (GPS) that they were continuing their discussion of the potential benefits of a Global Protection System against ballistic missiles, agreeing that it was important to explore the role for defences in protecting against limited ballistic missile attacks. They also agreed that they should work together with allies and other interested States in developing a concept for such a system as part of an overall strategy regarding the proliferation of ballistic missiles and weapons of mass destruction. 72/

6. Other proposals

220. In 1985, a broader approach to the question of international cooperation in space technology was suggested by the Soviet Union, which proposed the formation of a World Space Organization (WSO) to coordinate and promote global cooperation in space development. 73/ The programme of work would include:

(a) Communication, navigation, rescue of people on Earth, in the atmosphere and outer space;

(b) Remote sensing of the Earth for agricultural development of the natural resources of the land, the world's seas and oceans;

(c) The study and preservation of the Earth's biosphere;

(d) The establishment of a global weather forecasting service and notification of natural disasters;

(e) The development of new sources of energy and the creation of new materials and technologies;

(f) The exploration of outer space and celestial bodies by geophysical methods and by means of unmanned interplanetary spacecraft. 74/

221. In August 1987, the Soviet Union suggested the creation of an International Space Inspectorate (ISI). This proposal was subsequently elaborated, 75/ on the basis that:

> "On-site inspection directly before launch is the simplest and most effective method of making sure that objects to be launched into and stationed in space are not weapons and are not equipped with weapons of any kind."

222. Suggested measures within the concept of International Space Inspectorate included:

> "(a) Advance submission by the receiving State to the representatives of the International Space Inspectorate of information on every forthcoming launch, including the date and time of launch, the type of launch vehicle, the parameters of the orbit, and general information on the space object to be launched;
>
> "(b) The permanent presence of inspection teams at all sites for launching space objects in order to check all such objects irrespective of the vector;
>
> "(c) The start of inspection - days before the object to be launched into space is mounted on the launch vehicle or other vector;
>
> "(d) The holding of inspections also at agreed storage facilities, industrial enterprises, laboratories and testing centres;
>
> "(e) The verification of undeclared launches from undeclared launching pads by means of ad hoc on-site inspection." 76/

223. Although the proposal for an International Space Inspectorate was advanced in the context of an agreement that would ban all space weapons, this approach, in the Soviet Union's view, could be also considered as the basis for a free-standing initiative to enhance transparency and predictability.

224. Space-related matters have been proposed as a possible area of interest in some regional and multilateral arms control and disarmament negotiations.

225. The Tenth Conference of the Heads of State or Government of Non-Aligned Countries, which met in Jakarta from 1 to 6 September 1992, called for "the establishment of a multilateral satellite verification system under the auspices of the United Nations", which would ensure equal access to information for all States. 77/

C. Analysis

226. Although each of those suggestions makes a positive contribution to understanding the opportunities for confidence-building in outer space, there remain a number of issues that need to be more fully addressed.

1. General measures to enhance transparency and confidence

227. Based on the experience in other terrestrial arenas, the application of additional measures to increase the level of information concerning current and future space activities seems highly appropriate. The precedent of steps for providing improved predictability in the bilateral Defence and Space Talks is a useful beginning.

228. Two aspects, however, require further attention. The first relates to the question of whether such confidence-building measures have the character of voluntary steps that each State is free to exercise as it chooses, or whether they constitute legal obligations incumbent on all States. While many of these steps could provide an effective method for publicly demonstrating the character of a State's space activities, it remains to be seen how far States would be prepared to go in this direction in the absence of general reciprocity. From the point of view of some States, there is a necessity for some States to protect certain intelligence-related space activities; this is a factor that has to be taken into consideration.

229. The second question relates to the nature of activities that might be disclosed. From one perspective, these transparency measures would help to demonstrate that no proscribed space activities are occurring. From another perspective, such measures would be used to reduce the likelihood of misunderstanding or misperception with respect to space weapons and other activities.

230. Although many of the confidence-building mechanisms that have been suggested would be applicable in either context, agreement on which context is relevant may have significant consequences for the initiation and implementation of such measures.

2. Strengthening the registration of space objects and other related measures

231. A revision and strengthening of the provisions of the Registration Convention is, from the point of view of some States, one of the avenues for strengthening the international space legal regime covering military and other activities in space.

232. The proposal for an International Trajectography Centre also raises some operational concerns. In 1989, France noted that:

> "... to give, say, the precise position of an observation satellite is, however, to disclose thereby the precise object of its monitoring function. How, then, to reconcile the constraints of confidentiality

with the gathering of all the requisite information concerning satellite's trajectories!"? 78/

233. While this may be the situation for imaging intelligence satellites with optical systems, which must modify their orbits so that they fly directly over an area of interest, more sophisticated imaging satellites are not so constrained. However, concerns about the confidentiality of orbital information are still present, since notice of an impending overflight could provide sufficient warning to permit concealment from observation from space.

234. France further suggested that:

> "... the grouping of that information in a computer system operating on the 'black box' principle could constitute an appropriate solution ... (the centre) ... would receive and store, without publishing it, the orbital data declared at the time of registration and updated in the event of any subsequent change of trajectory." 79/

235. However, given the present level of classification that surrounds the orbits of intelligence satellites, it is necessary that such a centre should provide a sufficient level of protection for such information. This situation may evolve with increasing confidence among the major space Powers, which, thanks to their developed tracking facilities, would allow the cross-verification of the data communicated to the centre. In any case, it may appear profitable for space Powers to communicate data concerning their satellites in exchange of the immunity of the latter.

3. Code of Conduct and Rules of the Road

236. Keep-out zones should be in conformity with the provisions of the Outer Space Treaty. Keep-out zones could be established in a multilateral context, and considered in a functional manner.

237. The need for a separate regime to guarantee the immunity of certain classes of satellites from attack has been questioned. It has been suggested that:

> "... international legal instruments already exist intended to ensure the immunity of satellites. These instruments prohibit the use of force against satellites except in cases of self-defence. Indeed, these international agreements go further than the proposals because they also prohibit the threat of the use of force against satellites. On the other hand, if these proposals mean to prohibit nations from taking actions against satellites in legitimate cases of self-defence, then they undermine the Outer Space Treaty, the United Nations Charter, and the inherent right of sovereign States to take adequate measures to protect themselves in the event of the threat or use of force." 80/

238. The question of precisely which type of satellites would be granted immunity remains to be studied further. It has been noted that:

"... information gathered by reconnaissance and surveillance satellites has also been used in support of military operations. However, if the functions performed by reconnaissance and surveillance satellites are as benign as they are sometimes made out to be, one may well ask why this capability should remain the monopoly of the space Powers. Should we not entrust surveillance and reconnaissance activities by satellite to an international agency in order to monitor compliance with disarmament agreements?" 81/

239. It might be easier, at least initially, to reach international agreement on granting some appropriate form of protection to satellites owned and operated by international organizations than it would be to reach such an agreement on generic categories of satellites.

240. One of the problems with suggestions for grants of immunity is that many space systems have multiple applications. Military satellites may serve various missions depending on the operational context, while other satellites may perform both military and civilian functions.

241. Imaging intelligence satellites are used for arms control treaty verification, a function that is generally accorded a privileged status. But these same satellites can also support targeting of terrestrial weapons, an application that is a source of some ambivalence in the international community, and an impetus to the development of anti-satellite weapons. It is difficult to imagine how immunity could be granted to a satellite when it is performing its treaty verification function, while denying immunity to the same satellite a few minutes later as it supports targeting in some terrestrial conflict.

242. The viability of declarations on immunity would also be open to question as long as States were in the possession of means to attack and destroy satellites. The existence of robust anti-satellite capabilities would largely negate the significance of such declarations. France has proposed to grant legal immunity to all satellites that are not capable of active interference with other objects, that is, serving only stabilizing functions as opposed to aggressive uses of outer space. 82/

4. The international transfer of missile and other sensitive technologies

243. In the past, the question of the development of space weapons was discussed largely in an East-West context, a focus that has substantially altered since the dramatic changes in the international environment. To an increasing extent, the question is now framed in a much broader context. The concerns of some countries over the proliferation of missile and other sensitive technologies require appropriate international arrangements.

244. New appropriate international arrangements for the transfer of space-related technology could provide a number of avenues for responding to security concerns posed by a number of States on the question of dual use technologies.

VII. MECHANISMS OF INTERNATIONAL COOPERATION RELATED TO CONFIDENCE-BUILDING MEASURES IN OUTER SPACE

245. Resolution 45/55 B, which defines the mandate of the Study Group, recognized "the relevancy space has gained as an important factor for the socio-economic development of many States". In the same resolution, the General Assembly requested the Group to examine, inter alia, "possibilities for defining appropriate mechanisms of international cooperation in specific areas of interests and so on ..."

246. Priorities in specific areas of cooperation vary from one State and from one region to another. For the purposes of the study, international cooperation is viewed in the broader sense, including cooperation related to confidence-building measures in outer space. This chapter therefore examines two categories of international mechanisms and proposals for creating new mechanisms.

A. Existing mechanisms of international cooperation in outer space

247. There are three categories of international mechanisms of international cooperation in outer space: global, regional, and bilateral.

1. Global mechanisms of international cooperation in outer space

248. The United Nations has dealt with the questions concerning outer space since the beginning of the space age, mainly in two broader areas of its activities: peaceful uses of outer space and prevention of an arms race in outer space.

249. Growing interest in peaceful uses of outer space led to the establishment, in 1959, of the Committee on the Peaceful Use of Outer Space (COPUOS) which was charged to report to the General Assembly on various aspects of the peaceful use of outer space, including: (a) activities of the United Nations and its specialized agencies; (b) dissemination of data on outer space research; (c) coordination of national research programmes; (d) further international arrangements to facilitate international cooperation in outer space within the framework of the United Nations; (e) and legal problems that might arise as a result of the exploration of outer space. The annual reports of the Committee are considered by the Special Political Committee of the United Nations General Assembly.

250. Since then, the work of the Committee and its two subcommittees - one concerned with legal issues, the other with scientific and technical matters - has led to the formulation of five international instruments dealing with general principles for the exploration and use of outer space, the rescue of astronauts and the return of objects launched into outer space, liability for damage caused by space objects, the registration of objects launched into space and activities on the Moon and other celestial bodies.

251. The following questions are, inter alia, on the agenda of COPUOS 83/: (a) ways of maintaining outer space for peaceful purposes; (b) the work of its Scientific and Technical Sub-Committee and its Legal Sub-Committee; (c) the implementation of the recommendations of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space; (d) spin-off benefits of space technology, etc. For details see chapter III above.)

252. In addition to the elaboration of the above-mentioned agreements, the General Assembly, at the recommendation of COPUOS, has adopted the following Principles: (a) the Declaration of Legal Principles Governing the Activities of States in the Exploration and the Use of Outer Space (resolution 1962 (XVIII); (b) Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (resolution 37/92); (c) Principles Relating to Remote Sensing of the Earth from Space (resolution 41/65) and (d) Principles Relevant to the Use of Nuclear Power Sources in Outer Space (resolution 47/68).

253. To contribute to the use of outer space for peaceful purposes, the United Nations has organized two special conferences on the subject: the First United Nations Conference on the Peaceful Uses of Outer Space 84/ was held in 1968 to examine the practical benefits of space exploration and research and the opportunities available to non-space powers to cooperate institutionally in space activities. The Second Conference, known as UNISPACE 82, 85/ was held in Vienna in August 1982. The Conference recommended, inter alia, guidelines for the rapidly growing use of space technology; called for the establishment of a United Nations space information system, initially to consist of a directory of information and data services accessible to all States. The Conference also considered the question of the utilization of outer space and stated that preventing an arms race in outer space was essential if States were to continue to cooperate with each other in the exploration and use of outer space for peaceful purposes.

254. Parallel to the United Nations activities related to the peaceful uses of outer space, the question of preventing an arms race in outer space has been on the General Assembly agenda since the early 1950s. As early as 1957, proposals were made in the Disarmament Commission 86/ for an inspection system that would ensure that objects launched into outer space would be solely for peaceful purposes. The desire of the international community to prevent an arms race in outer space was expressed, as indicated earlier, by the General Assembly in its 1978 Final Document, adopted at the tenth special session devoted to disarmament, which stated that "in order to prevent an arms race in outer space, further measures should be taken and appropriate international negotiations held in accordance with the spirit of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies" (para. 80).

255. The question of preventing an arms race in outer space has been on the agenda of the General Assembly since 1982. A number of resolutions have been adopted requesting the Conference on Disarmament to consider the question of negotiating effective and verifiable agreements for preventing an arms race in outer space or to consider as a matter of priority the question of negotiating an agreement to prohibit anti-satellite (ASAT) systems.

256. Since 1982, the Conference on Disarmament, the sole multilateral negotiating body on this subject, has had on its agenda an item entitled "Prevention of an arms race in outer space". However, because of differing views concerning the formulation of a mandate, it was only in 1985 that the Conference on Disarmament 87/ was able to set up an ad hoc committee with a mandate to examine, as a first step, through substantive and general consideration, issues relevant to the subject.

257. The Ad Hoc Committee has continuously, since its inception, examined three subject areas within its mandate:

(a) Issues relevant to the prevention of an arms race in outer space;

(b) Existing agreements governing space activities; and

(c) Existing proposals and future initiatives on the prevention of an arms race in outer space.

Some States in the Ad Hoc Committee have been advocating adopting several confidence-building proposals as contributions to the prevention of an arms race in outer space.

258. In addition, the United Nations has additional functions related to space activities of States. Thus, the Secretary-General has been appointed as depositary of the Convention on Registration of Objects Launched in Outer Space (1975); the ENMOD Convention of 1977, and the Agreement Governing the Activities on the Moon and Other Celestial Bodies of 1979.

259. According to the Convention on Registration of Objects Launched into Outer Space, 88/ the States Parties have undertaken to maintain a central registry and to provide the Secretary-General of the United Nations with information on the space objects they have launched. According to articles 3 and 4, the mandatory reporting of space launches and the structure of the uniform system to be maintained by the Secretary-General is provided as follows:

1. Each State of registry shall furnish the Secretary-General of the United Nations, as soon as practicable, the following information concerning each space object on its registry:

(a) The name of the launching State or States;

(b) An appropriate designator of the space object or its registration number;

(c) The date and territory or location of launch;

(d) Basic orbital parameters, including:

(i) nodal period,

(ii) inclination,

(iii) apogee,

(iv) perigee;

(e) The general function of the space object.

2. Each State of registry may, from time to time, provide the Secretary-General with additional information concerning a space object carried on its registry;

3. Each State of registry shall notify the Secretary-General to the greatest extent feasible and as soon as practicable, of space objects concerning which it has previously transmitted information and which have been, but no longer are in Earth orbit.

260. In the framework of multilateral mechanisms, it is noteworthy to mention two additional organizations: the International Telecommunication Satellite Organization (1971) and the International Maritime Satellite Organization (1976).

261. The International Telecommunications Satellite Organization (INTELSAT) is a commercial cooperative of 124 countries that owns and operates a global communications satellite system that is used by more than 170 countries around the world for international communications and by more than 30 countries for domestic communications. INTELSAT has been providing satellite services for public telecommunications since 1965 by means of a successive series of satellites known as INTELSAT I to VI. As of July 1992, the INTELSAT space segment consists of 18 INTELSAT V, V-A and VI satellites in geostationary orbit over the Atlantic, Pacific and Indian Ocean regions. INTELSAT VII, which is currently the most technically advanced commercial satellites ever designed, will be launched in 1993. 89/

262. The International Maritime Satellite Organization (INMARSAT) was established on the initiative of the International Maritime Organization (IMO). The INMARSAT Convention and Operating Agreement were adopted in September 1976 and entered into force in July 1979. INMARSAT was originally established to meet the needs of international shipping for reliable communications. Amendments to the constituent instrument to extend INMARSAT's competence so that it can provide aeronautical satellite communications entered into force on 13 October 1989. Further amendments were adopted by the INMARSAT Assembly of Parties in January 1989 to enable INMARSAT to provide land mobile communications, but these amendments have not yet entered into force. INMARSAT is required to act exclusively for peaceful purposes. Its space segment is open for use by ships, aircraft and land mobile users of all nations, without discrimination on the basis of nationality. As of 31 May 1993, 67 States were Parties to the Convention. 90/

2. Regional multilateral mechanisms

263. Parallel to the efforts made within the United Nations framework and in the Conference on Disarmament, there are several international instruments regarding activities of States in outer space of a given region, on the basis of which intensive cooperation has taken place.

264. The International Organization of Space Communications (INTERSPUTNIK) was established in 1971 by an Agreement signed in November 1971, which entered into force in July 1972. It was established to meet the demands of various countries for telephone and telegraph communications and the exchange of radio and television programmes, as well as transmission of other kinds of information via satellite with a view to enhancing political, economic, and cultural cooperation. The following countries have been members of INTERSPUTNIK: Afghanistan, Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Kazakhstan, the Democratic People's Republic of Korea, Laos, Mongolia, Poland, Romania, USSR, Viet Nam and the People's Democratic Republic of Yemen. At present INTERSPUTNIK is in a transitional period, as States consider the possibility of its functioning on a purely commercial basis. 91/

265. In 1975, the European Space Conference, meeting in Brussels, approved the text of the Convention setting up the European Space Agency (ESA). The Member States are Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Finland is an associate member, and Canada a closely cooperating State. According to the Convention, the purpose of the Agency is to provide for and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space application systems. 92/

266. In April 1967, a programme of comprehensive cooperation among the socialist countries for the peaceful uses of outer space was formed and later named the Council on International Cooperation in the Study and Utilization of Outer Space (INTERCOSMOS). Multilateral cooperation among those countries under the INTERCOSMOS programme was given legal status with the signature of an intergovernmental Agreement on Cooperation in the Peaceful Exploration and Use of Outer Space, which was signed in Moscow in July 1976 and entered into force in March 1977. Joint efforts under the INTERCOSMOS programme have been conducted in five main areas: space physics, including space material science; space meteorology; space biology and medicine; space communications and remote sensing of the Earth. Ten countries (Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the Union of Soviet Socialist Republics and Viet Nam) participated in the programme. Its future status and specific forms of possible cooperation are at present under discussion. 93/

267. The members of the Arab League founded the Arab Satellite Communication Organization (ARABSAT) by the adoption of the ARABSAT Charter, signed in April 1976. Twenty-one Arab States are members of the ARABSAT communication service. Its main objective is to establish and maintain a regional telecommunications systems for the Arab region. 94/

268. In Africa a framework exists in the field of remote sensing - training, exchange of data, etc. - pursuant to the resolutions adopted by the Organization of African Unity and the United Nations Economic Commission for Africa - and coordinated by the African Organization for Cartography and Remote Sensing.

269. The European Telecommunication Satellite Organization (EUTELSAT) was created in May 1977 by 17 European telecommunications administrations or recognized private operators of the European Conference of Postal and

Telecommunications Administrations (CEPT). The organization attained its definitive form on 1 September 1985 upon the entry into force of an International Convention and an Operating Agreement signed by 26 European States. EUTELSAT now has 36 member countries. 95/

270. The European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) is an intergovernmental organization founded by 16 European member States and their meteorological services. The EUMETSAT Convention entered into force on 19 June 1986. Its primary objective is to establish, maintain and exploit European systems of operational meteorological satellites, taking into account as far as possible the recommendations of the World Meteorological Organization (WMO). 96/

271. The Western European Union (WEU) is one example of a regional effort to develop confidence-building initiatives related to space. The WEU has recently decided to set aside ECU 10 million for the implementation of a remote sensing centre, being now established in Torejon, Spain.

272. The agreement between France, Spain and Italy to develop and operate jointly the HELIOS imaging intelligence satellites is another example of a subregional arrangement that builds confidence in space among the Parties.

273. The II Space Conference for the Americas, held in Santiago de Chile from 26 to 30 April 1993, adopted a Declaration, whereby it emphasized the need for regional and international cooperation in the peaceful uses of outer space. The Conference also identified concrete areas and specific projects for cooperation among States of that region and also with States of other regions.

274. The first Asia-Pacific Workshop on Multilateral Cooperation in Space Technology and Applications, held in Beijing, China in December 1992, made a set of recommendations emphasizing the need for regional and international cooperation in space technology and its applications and proposed to identify, at its next workshop, potential multilateral cooperation projects among States of the Asia-Pacific region.

3. Bilateral mechanisms

275. As indicated earlier, negotiations between the United States and the Soviet Union have produced some of the fundamental agreements related to their military activities in outer space, notably the Anti-Ballistic Missile Treaty of 1972. 97/ The ABM Treaty provides, inter alia, for a Standing Consultative Commission of the two States to promote its objectives and implementation. The details concerning the Commission were elaborated in the Memorandum of Understanding Between the Government of the United States of America and the Government of the Union of the Soviet Socialist Republics Regarding the Establishment of A Standing Consultative Commission 98/ of 21 December 1972.

276. The Standing Consultative Commission has been used for cooperation between the United States and the Soviet Union in promoting and implementing agreements signed within the framework of SALT-I and SALT-II 99/. The Treaty on the Elimination of Their Intermediate-Range and Shorter Range Missiles (INF Treaty

of 1987) provides for the establishment of a Special Verification Commission. 100/

277. On the basis of the Treaty on Reduction and Limitation of Strategic Offensive Arms (START-I), 101/ a Joint Compliance and Inspection Commission was established. On the basis of the Protocol to the Treaty, signed in Lisbon in March 1992, representatives of Belarus, Kazakhstan, and Ukraine, as well as of the Russian Federation, will participate in the work of the Commission.

278. On the basis of the Treaty on Further Reduction and Limitation of Strategic Offensive Arms (START-II), 102/ the Russian Federation and the United States established a new Bilateral Implementation Commission for resolving questions related to compliance with obligations assumed.

279. In addition, several agreements mainly concerning confidence-building between the two leading space Powers, such as the Nuclear Accident Agreement (1971); the Hot Line Agreement (1971); the Agreement on the Establishment of Nuclear Risk Prevention Centres (1987); and the Notification Agreement (1989) are providing for the notification, monitoring, verification and creation of different mechanisms or to use some existing mechanisms (such as an INTELSAT satellite circuit and a STATSIONAR satellite circuit), which are relevant to the prevention of an arms race in outer space.

280. The most recent Space Agreement between the United States and the Russian Federation (17 June 1992) on cooperation between the two countries provides a broad framework for cooperation related to space activities.

281. Various forms of international cooperation in space related matters exist in other bilateral agreements among different States of different regions.

B. Some proposals for creating new international mechanisms of international cooperation in outer space

282. While the overview of the existing global, regional and bilateral mechanisms of international cooperation in outer space shows the extent of cooperation existing among States concerning their activities in outer space, none of the above-mentioned mechanisms, even those of global character, is an all-embracing organization that covers all aspects of space activities. Consequently, there are several proposals to expand existing mechanisms and/or to create new ones.

283. In general, most of the proposals put forward to date are linked to monitoring and/or verification of existing or future arms limitation agreements or represent a part of more comprehensive proposals concerning activities of States in outer space. As monitoring and verification could be a part of any international agreement on the prevention of an arms race in outer space, they could at the same time contribute to confidence-building and thus to furthering cooperation among States.

284. It is obvious that any monitoring or verification mechanism of arms limitation and disarmament agreements will be a very complex matter involving a

wide spectrum of procedures such as Earth-to-space, space-to-space, space-to-Earth, air-to-ground, and on-site monitoring. Such an elaborate network would necessarily have to be designed to improve confidence-building.

285. Among the most widely discussed plans, are the French and Soviet proposals discussed in chapter V above. At the first special session of the General Assembly devoted to disarmament, in June 1978, France put forward a detailed proposal for the establishment of an International Satellite Monitoring Agency (ISMA). 103/ One of the proposal's main features was that existing and future disarmament and security agreements should be monitored, presumably via some special arrangement between the Contracting Parties and the Agency. The French proposal suggested that the Agency should be set up in stages and in 1981 became a subject of the United Nations study: The Implications of Establishing an International Satellite Monitoring Agency. 104/ The study outlined the missions and facilities needed for ISMA, its organizational structure and the technical, legal and financial implications of its establishment.

286. At the second special session of the General Assembly devoted to disarmament, in 1988, the Soviet Union proposed that the Conference on Disarmament should be charged with undertaking detailed negotiations on the establishment of an International Space Monitoring Agency (ISpMA). 105/ Although the Soviet proposal would be based on the same principles as that of the French, there are several differences. The Soviet proposal suggested that the Agency should be developed in two stages, the first being a period for training the personnel and structuring the Agency itself, during which information would be supplied by States possessing space monitoring facilities and a Space Processing Inspectorate Centre (SPIC) would be created. The second stage would involve primarily the development of the ground segment by creating a network of data-reception points. 106/

287. In March 1988, the Soviet Union proposed the creation of an International Space Inspectorate (ISI) 107/ to verify the non-deployment of weapons of any kind in outer space. As ISI is based on the principle of on-site inspections before the launching of space objects, the scope of prohibition envisaged would include weapon systems equipped to conduct ground, air, or outer space strikes, "... irrespective of the physical principles on which they are based".

288. The Canadian proposal, PAXSAT, 108/ or peace satellite, is a verification concept using space-based remote-sensing technology. As outlined in chapter V above, it has two potential applications, respectively PAXSAT A and PAXSAT B. In the first application, PAXSAT would be associated with agreements on outer space that entails space-to-space remote-sensing capability. By using non-classified technology, PAXSAT A research is aimed at designing a satellite that can accurately ascertain whether other objects in orbit are able to perform as space weapons (e.g. ASAT weapons) or have space weapon capability. PAXSAT B is a segment of a Canadian research project that is to be associated with agreements calling for the regional ground observation. In addition, PAXSAT research also embraces the development of a database, presumably on space objects for application A and on conventional forces and weapons for application B.

289. In 1989, France proposed the establishment of an International Trajectography Centre (UNITRACE). 109/ Since it would be designed to alert the States concerned in the event of threatened incidents and to supply evidence of

good or bad faith in the event of an accident, it should meet the requirement of transparency and should also be in permanent possession of up-to-date information concerning the trajectories of space objects. At the same time, if it is to be acceptable to satellite-owning States, such a centre should be able to observe a degree of confidentiality in respect of military activities in space. Under the auspices of the United Nations Secretariat, it would have the following functions:

(a) collection of data for updating registrations;

(b) monitoring of space objects;

(c) real time calculation of all possible trajectories.

290. Considering that the implementation of regional agreements on confidence-building and security could draw to an increasing extent on the use of satellite images, France was prepared to contribute to the establishment and operation of regional agencies responsible for transparency in three forms:

(a) assistance in training specialists in the interpretation of satellite data;

(b) study of the possible structure and size of the reception facilities (engineering), which might be made available to States participating in such agencies;

(c) initiation of more far-reaching consideration of the question of access to data and satellite information and discussion with other countries producing space images, with a view to possible agreements to supply regional agencies, at their request, with the information they need to perform such tasks.

291. At the forty-seventh session of the General Assembly, France indicated that it was going to propose a measure to enhance confidence by making it mandatory to give advance notice of the firing of ballistic missiles and rockets carrying satellites or other space objects. That notification measure, if adopted, would be complemented by the establishment of an international centre, under United Nations auspices, responsible for collecting and using the data received. 110/

292. France elaborated its proposal in a working paper which it submitted in the Ad Hoc Committee on Prevention of an Arms Race in Outer Space of the Conference on Disarmament on 12 March 1993. 111/ France proposed, inter alia, the establishment, through a new international instrument, which could be negotiated at the Conference on Disarmament, of a regime of prior notification of launches of space launchers and ballistic missiles. Such a regime should be supplemented by the establishment of an International Notification Centre responsible for the centralization and redistribution of collected data, so as to increase the transparency of space activities. The Centre would be set up under the auspices of the United Nations and legally attached to it, and could take the form of a division of the Office for Disarmament Affairs of the United Nations Secretariat. The main function of the Centre would be to receive notification of launches of ballistic missiles and space launches transmitted to it by States Parties. It would receive the information transmitted by States on launches

actually carried out. States possessing detection capabilities, would be invited to communicate to the Centre, on a voluntary basis, data relating to launches they have detected; and it would place such information, through a data bank, at the disposal of the international community.

293. The establishment of a "World Space Organization" 112/ was suggested by the Soviet Union in 1985 as a broader mechanism for international cooperation. The suggested functions of such Organization have been outlined in some detail in chapter VI.

VIII. CONCLUSIONS AND RECOMMENDATIONS

294. Since the adoption of resolution 45/55 B by the General Assembly, there has been substantial and rapid political change providing a new international context in which confidence-building measures in outer space have to be considered. New opportunities for global, regional and bilateral cooperation have arisen in space activities.

295. The Group of Experts therefore concludes that these changes, together with developments in technology, have not only preserved the relevance for confidence-building measures in space, but have also created an environment conducive to their implementation.

296. The Group of Experts believes that it has been demonstrated that space missions and operations have the potential to provide substantial scientific, environmental, economic, social, political and other benefits, and that the space environment should be used for the progress of humankind. Thus there is a clear tendency for a growing number of States to expand their activities related to outer space, some considering a military component important to their space activities. All space activities, though, should be conducted to enhance international peace and security.

297. It has been concluded by the Group that space applications are becoming more significant in terms of benefits in all respects and, accordingly, increasingly meaningful in both strategic and civilian aspects of life on earth. The use of space also has the potential to increase, aggravate or, by contrast, mitigate tension between States.

298. The Group finds that a significant part of the main concerns among the vast majority of States is still related to the possibility of introducing weapons in outer space. Some other military activities are also subjects of concern. To the vast majority of States, the question of access to and benefits from space technology is also becoming a significant factor that may need to be addressed specifically by confidence-building measures.

299. The rights of all States to explore and use outer space for the benefit and in the interest of all humankind is a universally accepted legal principle. It is the concern and responsibility of all States to ensure that these rights are realized in accordance with international law in the interest of maintaining international peace and security and promoting international cooperation.

300. The Outer Space Treaty, the cornerstone of international space law, was adopted in 1967, an era prior to the wider use of space technology for telecommunications purposes, prior to the availability of remote sensing systems, and prior to the incorporation of space applications into much of the civil infrastructure and capabilities of States. The rapid advances in space technologies require keeping continuously under review the need for updating or supplementing the current international legal regime.

301. The Group therefore concludes that legal norms may have to be developed further, whenever appropriate, to address new developments in space technology and increasing universal interest in its application. In this context, the need

to formulate a framework for the enhancement of cooperation and confidence-building among States was expressed in the Group.

302. The significant contribution of space activities to national and regional development, as well as to international understanding, is enhanced to the extent that such activities are conducted in a safe environment free from outside threats. It is also observed that concerns can arise from the fear of either a military or economic advantage provided through space, as well as from the difficulty of accessing the desired benefits of space applications in a cost-effective manner.

303. In addition to the status and capabilities of individual nations, the Group concludes that aspects of global and regional balance are to be taken into consideration. Given the complementary nature of space to military forces on the ground, some confidence-building measures may be contemplated with respect to neighbouring States or groups of States in cases of tension. The Group observes that advanced space technologies, providing a planetary perspective, have created a sense that any point on Earth could be reached from space. The Group therefore considers that all States can and should be involved at the global level in confidence-building regarding space.

304. The Group agrees that the application of space technologies is ambivalent in nature and that dual-purpose aspects of sensitive technologies should not be defined as harmful per se. It is the way in which they are utilized that determines whether they are harmful or not. Because the unilateral or rapid expansion of certain space capabilities by States can arouse suspicion in other States, the Group concludes that the extension of such capabilities should be accompanied, when appropriate, by a confidence-building framework designed to enhance transparency and openness. These space capabilities should also be developed in accordance with internationally agreed provisions ensuring their non-diversion for prohibited purposes.

305. There is potential concern, however, on both military and economic grounds that a State acquiring data revealing the weaknesses or other circumstances of another State could be exploited to the detriment of that State. Some countries fear that transparency measures regarding their space activities could affect their national security. Therefore transparency measures should be designed in such a way as to reconcile the need to build international confidence and the protection of national security interests.

306. The concerns are not only those that can be directly recognized, but also those related to the degree of commitment by others to confidence-building measures. Accordingly, the Group concludes that due consideration be given to the assessment of the implementation of confidence-building measures to ensure compliance, as well as making appropriate use of any verification provisions that may be included.

307. The Group has considered the span of technology and facilities required in a space mission, for the development of the spacecraft itself, the launch vehicle and launch operations, including tracking support as well as all other related operations during its lifetime. It is noted that many States have, as a matter of necessity or choice, specialized in specific fields, relying on others to complement these areas and fulfil their additional requirements. The Group

believes that this is an important factor to be taken into account in addressing confidence-building measures.

308. The Group concludes that, in consideration of possible confidence-building measures in outer space, the differences in space capabilities among States should be taken into account. For the time being, only the United States and the Russian Federation have the full diversity of technology and available hardware to achieve self-sufficiency in the full diversity of space missions. Beyond this, there is a second, larger group of States that have achieved self-sufficiency within specific space missions. There is also a third substantial group of States that have space-related capabilities in specialized technologies or facilities, but lack autonomy in space. This includes those with direct space experience and ongoing programmes, as well as those with missile or other technologies that can be rapidly applied to space missions or portions thereof.

309. All States have legitimate interests in space and, in many cases, are benefiting from space activities. Some of them even own and operate space or space-associated assets, but are largely or totally dependent upon the commercial or political actions of others for their participation in space activities.

310. The disparities in levels of space capabilities among these groups, as well as among individual States, the inability to participate in space activities without the assistance of others, uncertainty concerning sufficient transfer of space technologies and the inability to acquire significant space-based information are factors in the lack of confidence among States. The existence of such factors may not be conducive to prevention of an arms race in outer space. In this context, the Group concludes that issues of access to and benefits from space should be addressed in order to promote cooperation and confidence-building among States.

311. The Group observes that full autonomous space capabilities in all States is neither technologically nor economically feasible in the foreseeable future. It therefore concludes that international cooperation is an important vehicle for promoting the right of each nation to achieve its legitimate objectives to benefit from space technology for its own development and welfare. Cooperation, with involvement of other nations, in the achievement of national objectives, requires confidence in the capabilities of others and in the policies providing access to these capabilities.

312. The Group concludes that some confidence-building measures in outer space could be considered as complementary to such measures applicable to terrestrial military activities and arrangements, thus constituting a wider body of mechanisms aimed at creating and maintaining confidence between States.

313. The Group observes that there are several causes of concerns in some States without military space capabilities regarding the application and use of such capabilities by other States. For example, certain space capabilities could serve as force multipliers in case of conflict, regional or otherwise. Satellites could be used to acquire data that could be exploited in a given military situation. Increased transparency can be instrumental in allaying

mistrust and building confidence with regard to all space-related means and capabilities.

314. The Group concludes that appropriate confidence-building measures between States could address some of these current causes of concerns. Transparency could help allay suspicion and thus remove some of the factors constraining international cooperation. Causes of concerns about space capabilities may also need to be addressed by measures of arms control and disarmament, as well as adjustments of transfers of technology, without inhibiting the potential growth and development of peaceful space capabilities. Confidence-building measures in space in relation to regional security arrangements may also be contemplated in this respect.

315. The Group has examined the ways in which a State can advance its space technology such as endogenous development, technology transfer, and technical assistance that allows the receiving State to move rapidly through different phases and bring its own skills to the desired levels. The Group concludes that international cooperation is important for the advancement of space technology.

316. The Group concludes that specific confidence-building measures addressing the dual-use nature of technologies related to space may help establish a better environment for international cooperation. It believes that use of such technologies should be encouraged and access to their benefits secured under appropriate national and internationally agreed provisions that ensure their non-diversion for prohibited purposes.

317. The Group has considered the possibility of concluding an international agreement on banning weapons in outer space and concludes that this question deserves further consideration. The Group concludes further that there are many States that believe that in view of the new political situation in the world, the time has come to begin full-scale negotiations to work out an international agreement on banning weapons in outer space. Those States believe that such an agreement could become one of the most effective confidence-building measures in itself.

318. The Group notes the growing importance of space systems in providing support for international diplomacy. The Group emphasizes the potential of these systems, which could promote the effectiveness of the United Nations in preventive diplomacy, crisis management, the settlement of international disputes and conflict resolution. The Group believes that this is an important aspect of the role of these systems in promoting confidence and stability in international relations.

319. The point of departure for the recommendations of the Group is the text of General Assembly resolution 45/55 B and the provisions of the Outer Space Treaty, as well as concepts of transparency, predictability, aspects of conduct, and international cooperation, which are being considered mainly in the Conference on Disarmament, the United Nations Disarmament Commission, and the United Nations Committee on the Peaceful Uses of Outer Space.

320. The Group recommends, first of all, that all States Parties strictly observe the provisions of the Outer Space Treaty and other treaties on outer space concluded under the auspices of the United Nations, since these

instruments include components establishing confidence among States. United Nations resolutions that enjoy universal support and that embody such principles on outer space can also contribute to confidence.

321. It is recommended by the Group that existing bilateral and multilateral mechanisms, particularly those multilateral mechanisms within the United Nations, should continue to play an important role in any further consideration and possible elaboration of specific confidence-building measures in the context of the prevention of an arms race in outer space. It is also suggested that the Conference on Disarmament be requested to continue considering further measures contributing to the prevention of an arms race in outer space. In this regard, should negotiations on further measures, including negotiations on outer space confidence-building measures, be required, the Conference on Disarmament should serve as an appropriate negotiating forum.

322. The Group of Experts recommends that the legal sub-committee of the Committee on the Peaceful Uses of Outer Space, within its mandate concerning the international legal regime governing outer space, continue to keep under review, inter alia, the Convention on Registration of Objects Launched into Outer Space with respect to staying abreast of technological developments and possible transparency and predictability needs.

323. The Group recommends that the International Satellite Monitoring Agency (ISMA) and the International Space Monitoring Agency (ISpMA) proposals be re-examined in the light of current and future developments. The Group has considered the possibility of the establishment of an international registry of orbital and functional data on vehicles and missions, which would receive submissions from tracking centres of Member States, and finds that this question deserves further consideration in view of its potential relevance to confidence-building.

324. The Group recommends building upon existing mechanisms related to space activities for alert in case of accidents or vehicle failure and to consider a role the United Nations might play in this respect. The idea of an international alert system may be further explored.

325. The Group of Experts recommends that States operating remote sensing systems operate these systems in conformity with United Nations General Assembly resolution 41/65, so as to contribute and facilitate the broadest access possible by the international community to remote sensing data on a non-discriminatory basis and at a reasonable cost, taking into account the needs and circumstances of the developing countries and the countries in transition.

326. The Group recommends that the concepts and proposals on "rules of the road", as possible components of confidence-building measures in outer space, should be kept under review. Factors such as manoeuvrability of spacecraft, potential conflicting orbits and predictability of close approaches should be taken into consideration.

327. The Group recommends that institutional mechanisms to encourage international cooperation among States in respect of space technology, including international transfer, should be evaluated, taking into account the legitimate concerns about dual-purpose technology. It is further recommended that measures

be considered to enable all States to have access to space for peaceful purposes on a cost-recoverable or reasonable commercial basis, and that those States that need assistance in this respect could make use of appropriate forms of technical cooperation, duly taking into account the needs of the developing countries and the countries in transition.

328. The Group recommends that COPUOS explore mechanisms coordinating various international space activities, including interplanetary exploration, environmental monitoring, meteorological science, remote sensing, disaster relief and mitigation, search-and-rescue, training of personnel and spin-off. In this context, concepts involving universal participation such as a "World Space Organization" are possible useful points of reference for this exploratory work.

329. The Group notes the view expressed that given the dual-use nature of some space technologies and the international character of the relevant issues discussed in the context of the prevention of an arms race in outer space and of the peaceful uses of outer space, the possibility of establishing working contacts between the Conference on Disarmament and COPUOS should be explored and appropriate actions considered by the General Assembly to encourage such contacts.

330. The Group of Experts concludes that appropriate confidence-building measures with respect to outer space activities are potentially important steps towards the objective of preventing an arms race in outer space and ensuring the peaceful use of outer space by all States.

331. The Group hopes that the present study will be a useful reference for the continuing work of the Conference on Disarmament, in its Ad Hoc Committee on Outer Space, the United Nations Disarmament Commission and the United Nations Committee on the Peaceful Uses of Outer Space, as well as other international bodies interested in outer space and the questions dealt with in this study.

Notes

1/ See Official Records of the General Assembly, Tenth Special Session, Supplement No. 4 (A/S-10/4), sect. III.

2/ General Assembly resolution 2222 (XXI), annex.

3/ For events which occurred before December 1991, reference is made to the Union of the Soviet Socialist Republics, and thereafter to the Russian Federation.

4/ The use of the word "satellite" here does not exclude the relevance of other forms of spacecraft, such as "space station", "space shuttle", "sky lab" etc.

5/ See: International Cooperation in the Uses of Outer Space - Activities of Member States, Note by the Secretariat (A/AC.105/505 and Add.1 to 3).

6/ Space Activities of the United Nations and International Organizations (United Nations publication, Sales No. E.92.I.30), pp. 135-136.

7/ Access to Outer Space Technologies: Implications for International Security, UNIDIR, Research Papers, No. 15, (United Nations publication, Sales No. GV.E.92.0.30).

8/ World Armaments and Disarmament, SIPRI Yearbook 1992 (Oxford University Press, 1992), pp. 509-530.

9/ The Treaty was adopted by the General Assembly on 13 December 1966 by resolution 2222 (XXI), annex, opened for signature on 27 January 1967, and entered into force on 10 October 1967. The text of the Treaty is reproduced in Space Activities of the United Nations and International Organizations, United Nations publication, Sales No. E.92.I.30, pp. 231-236.

10/ The Treaty was signed on 10 October 1963 and entered into force on the same date. The text of the Treaty is reproduced in Status of Multilateral Arms Regulations and Disarmament Agreements, 4th edition: 1992 (United Nations publication, Sales No. E.93.IX.11), vol. I, p. 33.

11/ The Agreement was adopted by the General Assembly on 19 December 1967 by resolution 2345 (XXII), and entered into force on 3 December 1968. The text of the Agreement is reproduced in Space Activities, op. cit., pp. 237-240.

12/ The Convention was adopted by the General Assembly on 29 November 1971 by resolution 2777 (XXVI), annex; opened for signature on 29 March 1972, and entered into force on 1 September 1972. The text of the Convention is reproduced in Space Activities, op. cit., pp. 241-249.

13/ Adopted by the General Assembly on 12 November 1974 in resolution 3235 (XXIX), annex; entered into force on 15 September 1976. The text is reproduced in Space Activities, op. cit., pp. 250-254.

14/ A revised Constitution and a revised Convention of the International Telecommunication Union (Geneva, 1992) were adopted at the Additional Plenipotentiary Conference (APP-92), which provided for their entry into force on 1 July 1994. Upon entry into force, the Geneva Constitution and Convention shall abrogate and replace the Nairobi Convention (1982), which is still in force. See International Telecommunication Union Convention, Nairobi, 1982, General Secretariat of the ITU, Geneva, ISBN 92-61-01651-0; the Nice Convention and Constitution signed on 30 June 1989, have not come into force. International Telecommunication Union, General Secretary, Geneva, 1989, PP-89/FINACTS/CONVO1E1.TXS.

15/ The Convention was signed on 18 May 1977 and entered into force on 5 October 1978. The text of the Convention is reproduced in Status, vol. I, p. 217.

16/ These Understandings are not incorporated into the Convention, but are part of the negotiating record and were included in the report transmitted by the Conference on Disarmament to the General Assembly in September 1976. The text is reproduced in Status, vol. I, p. 231.

17/ The Agreement was adopted by the General Assembly, by resolution 34/68, annex; opened for signature on 18 December 1979 and entered into force on 11 July 1984. The text of the Agreement is reproduced in Space Activities, op. cit., pp. 255-263.

18/ The Treaty was signed on 26 May 1972 and entered into force on 3 October 1972. The text of the Treaty is reproduced in Arms Control and Disarmament Agreements, Texts and Histories of the Negotiations, 1990 edition, United States Arms Control and Disarmament Agency, Washington, D.C. 20451, pp. 157-161.

19/ The SALT-I Agreement was signed on 26 May 1972 and entered into force on 3 October 1972. The text of the Agreement is reproduced in Arms Control and Disarmament Agreements, pp. 169-176.

20/ The SALT-II Treaty was signed on 18 June 1979, but never entered into force. The text of the Treaty is reproduced in Arms Control and Disarmament Agreements, pp. 267-300.

21/ The START-I Treaty was signed on 31 July 1991 and has not yet entered into force. It was supplemented by the Lisbon Protocol, signed on 23 May 1992 by Belarus, Kazakhstan, the Russian Federation, Ukraine and the United States. The text of the Treaty has been published as a CD document, CD/1192 and the text of the Protocol as CD/1193.

22/ The START-II Treaty was signed by the Russian Federation and the United States on 3 January 1993 and its entry into force depends on the entry into force of the START-I Treaty. The text of the Treaty has been published as a CD document, CD/1194.

23/ The Agreement was signed and entered into force on 30 September 1971. The text of the Agreement is reproduced in Arms Control and Disarmament Agreements, pp. 120-121.

24/ The Agreement was signed and entered into force on 30 September 1971. The text of the Agreement is reproduced in Arms Control and Disarmament Agreements, pp. 124-128.

25/ The USA and the USSR had agreed in 1963 to establish, for use in time of emergency, a direct communications link between the two Governments. The so-called "Hot Line" agreement provided for a wire telegraph circuit and, as a back-up system, a radio telegraph circuit. For the text of the Memorandum of Understanding with Annex, of 20 June 1963, see Arms Control and Disarmament Agreements, op. cit., pp. 34-36.

26/ The Agreement was signed and entered into force on 15 September 1987. Its text is reproduced in Arms Control and Disarmament Agreements, op. cit., pp. 338-344.

27/ The Agreement was signed and entered into force on 31 May 1988. Its text is reproduced in Arms Control and Disarmament Agreements, op. cit., pp. 457-458.

28/ The Agreement was signed on 12 June 1989 and entered into force on 1 January 1990. The text of the Agreement, its annexes and the agreed statements in connection with the Agreement is issued as a document of the Conference on Disarmament, CD/943, 4 August 1989.

29/ Official Records of the General Assembly, Eighteenth Session, Supplement No. 15 (A/5515), pp. 15-16.

30/ Ibid., Thirty-seventh Session, Supplement No. 51 (A/37/51), pp. 98-99.

31/ Ibid., Forty-first Session, Supplement No. 53 (A/41/53), pp. 115-116.

32/ See Resolutions and decisions adopted by the General Assembly during its forty-seventh session, 15 September to 23 December 1992.

33/ Official Records of the General Assembly, Tenth Special Session, Supplement No. 4 (A/S-10/4).

34/ Comprehensive Study on Confidence-Building Measures, United Nations publication, Sales No. E.82.IX.3.

35/ General Assembly Official Records: Fifteenth Special Session, Supplement No. 3 (A/S-15/3).

36/ Jasani, Buphendra, "Military Space Activities", Stockholm International Peace Research Institute Yearbook - 1978 (Taylor and Francis, London, 1978); and DeVere, G. T., and Johnson, N. L., "The NORAD Space Network", Spaceflight, July 1985, vol. 27, pp. 306-309; and North American Aerospace Defense Command, "The NORAD Space Detection and Tracking System", Factsheet, 20 August 1982.

37/ King-Hele, Desmond, Observing Earth Satellites (Macmillan, London, 1983).

38/ Manly, Peter, "Television in Amateur Astronomy", Astronomy, December 1984, pp. 35-37.

39/ The 2.3 meter telescope at Kitt Peak, Arizona has been used to produce images of the Hubble Space Telescope (McCaughrean, Mark, "Infrared Astronomy: Pixels to Spare", Sky & Telescope, July 1991, pp. 31-35) and the Mir space station ("Satellite Trackers Bag Soviet Space Station", Sky & Telescope, December 1987, p. 580).

40/ Jackson, P., "Space Surveillance Satellite Catalog Maintenance", AIAA Paper 90-1339, 16 April 1990.

41/ "PAXSAT Concept: The Application of Space-Based Remote Sensing for Arms Control Verification", External Affairs Canada, Verification Brochure, No. 2, 1987, 1988, pp. 97-102.

42/ "Address by His Excellency Mr. Valery Giscard d'Estaing, President of the French Republic", A/S-10/PV.3, 25 May 1978.

43/ Study on the Implications of Establishing an International Satellite Monitoring Agency - report of the Secretary-General, A/AC.206/14, 6 August 1981.

44/ France, Working Paper - Space in the Service of Verification - Proposal Concerning a Satellite Image Processing Agency, CD/945, CD/OS/WP.40, 1 August 1989.

45/ Statement by Mr. E. A. Shevardnadze, Minister of Foreign Affairs of the USSR, at the third special session of the General Assembly devoted to disarmament, A/S-15/PV.9.

46/ CD/OS/WP.39.

47/ "PAXSAT Concept", Verification Brochure, op. cit., pp. 97-102.

48/ The United Nations and Disarmament 1945-1970 (United Nations publication, Sales No. 70.IX.1), p. 174.

49/ See table 3.

50/ Prevention of an Arms Race in Outer Space: A Guide to the Discussion in the Conference on Disarmament, UNIDIR/91/79 (United Nations publication, Sales No. GV.E.91.0.17), pp. 107-128.

51/ CD/708.

52/ CD/941.

53/ CD/1092.

54/ CD/708.

55/ CD/1092.

56/ CD/PV.318, CD/PV.345 and CD/PV.516.

57/ Ibid.

58/ CD/937, CD/OS/WP.35.

59/ CD/1092.

60/ CD/PV.560.

61/ CD/937 and CD/PV.570.

62/ CD/945 and CD/937.

63/ CD/OS/WP.39.

64/ Original participants of MTCR are: Canada, France, Germany, Italy, Japan, United Kingdom and United States. See The Arms Control Reporter, 1993, 706.A.2.

65/ As of 31 December 1992, the following additional countries had become participants of MTCR (in chronological order): Spain, Australia, Denmark, Belgium, Netherlands, Luxembourg, Norway, Austria, Finland, Sweden, New Zealand, Greece, Ireland, Portugal and Switzerland. Ibid.

66/ France, "Arms control and disarmament plan submitted by France" (CD/1079, 3 June 1991).

67/ Argentina and Brazil, Working Paper entitled "International transfer of sensitive technologies" (A/CN.10/145, 25 April 1991).

68/ Ibid.

69/ United States of America, "Statement to the Outer Space Committee of the Conference on Disarmament" (CD/1087, 8 July 1991).

70/ Statement by Mr. Dhanapala of Sri Lanka (CD/PV.354, 8 April 1986).

71/ Statement by Mr. Ahmad of Pakistan (CD/PV.460, 26 April 1988).

72/ CD/1162.

73/ CD/PV.332, 22 August 1985, p. 23.

74/ Ibid.

75/ Union of Soviet Socialist Republics, "Establishment of an international system of verification of the non-deployment of weapons of any kind in outer space" (CD/817, CD/OS/WP.19, 17 March 1988).

76/ Ibid.

77/ Tenth Conference of Heads of State or Government of the Non-Aligned Countries, Jakarta, 1-6 September 1992, Final Document (A/47/675-S/24816), chap. II, para. 44.

78/ France, Working Paper entitled "Prevention of an arms race in space: proposals concerning monitoring and verification and satellite immunity", CD/937, CD/OS/WP.35, 31 July 1989). Emphasis on original.

79/ Ibid.

80/ "Statement by the representative of the United States of America in the Ad Hoc Committee on 2 August 1988" (CD/905, CD/OS/WP.28, 21 March 1989).

81/ Statement by Mr. Ahmad of Pakistan (CD/PV.413, 16 June 1987).

82/ CD/937, CD/OS/WP.35 of 31 July 1989.

83/ Official Records of the General Assembly, Forty-eighth Session, Supplement No. 20 (A/48/20).

84/ Space Exploration and Applications; Papers Presented at the Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 14-27 August 1968, United Nations publication, Sales No. E.69.I.16, vols. I and II.

85/ A/CONF.101/10 and Corr.1 and 2.

86/ The United Nations and Disarmament 1945-1970, United Nations publication, Sales No. 70.IX.1, pp. 66-68.

87/ Official Records of the General Assembly, Fortieth Session, Supplement No. 27 (A/40/27).

88/ Ibid., Sixteenth Session, A/RES/1721 (XVI), 20 December 1961, annex B.

89/ Space Activities of the United Nations and International Organizations. A review of the activities and resources of the United Nations, its specialized agencies and other international bodies relating to the peaceful uses of outer space, A/AC.105/521, United Nations publication, Sales No. E.92.I.30, pp. 164-173.

90/ Ibid., pp. 179-185.

91/ Ibid., pp. 174-175.

92/ Ibid., pp. 135-164.

93/ Ibid., pp. 175-178.

94/ Ibid., pp. 185-186.

95/ Ibid., pp. 187-188.

96/ Ibid., pp. 188-190.

97/ Arms Control and Disarmament Agreements, Texts and Histories of the Negotiations, United States Arms Control and Disarmament Agency, 1990 Edition, pp. 157-161.

98/ Ibid., pp. 175-176.

99/ Ibid., pp. 169-176; 267-291.

100/ Ibid., pp. 350-362.

101/ The Treaty and related documents were published in Arms Control and Disarmament Agreements: START, Treaty Between the United States of America and the Union of the Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms (United States Arms Control Agency), 1990, Washington, D.C.

102/ Text of the Treaty has been published as CD document CD/1194.

103/ Official Records of the General Assembly, Tenth Special Session, A/S-10/AC.1/7, 1 June 1978.

104/ A/AC.206/14, United Nations publication, Sales No. E.83.IX.3.

105/ Ibid., A/S-15/34.

106/ CD/OS/WP.39, 2 August 1989.

107/ CD/817, CD/OS/WP.19 of 17 March 1988.

108/ Canada, External Affairs, "PAXSAT Concept: The Application of Space-Based Remote Sensing for Arms Control Verification", Verification Brochure No. 2, 1987.

109/ CD/937 and CD/PV.570.

110/ Official Records of the General Assembly, Forty-seventh Session, Plenary Meetings, 8th meeting, Statement by Mr. R. Dumas, on 23 September 1992.

111/ Confidence-Building Measures in Outer Space, Notification of Launches of Space Objects and Ballistic Missiles, CD/OS/WP.59.

112/ The proposal was made in the Conference on Disarmament on 22 August 1985, CD/PV.332, p. 23.

APPENDIX I

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*

The States Parties to this Treaty,

Inspired by the great prospects opening up before mankind as a result of man's entry into outer space,

Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes,

Believing that the exploration and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development,

Desiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes,

Believing that such cooperation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples,

Recalling resolution 1962 (XVIII), entitled "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space", which was adopted unanimously by the United Nations General Assembly on 13 December 1963,

Recalling resolution 1884 (XVIII), calling upon States to refrain from placing in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, or from installing such weapons on celestial bodies, which was adopted unanimously by the United Nations General Assembly on 17 October 1963,

Taking account of United Nations General Assembly resolution 110 (II) of 3 November 1947, which condemned propaganda designed or likely to provoke or encourage any threat to the peace, breach of the peace or act of aggression, and considering that the aforementioned resolution is applicable to outer space,

Convinced that a Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, will further the purposes and principles of the Charter of the United Nations,

Have agreed on the following:

---

* General Assembly resolution 2222 (XXI), annex.

Article I

The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation.

Article II

Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means.

Article III

States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.

Article IV

States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner. The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.

Article V

States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party

or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle.

In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties.

States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.

Article VI

States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

Article VII

Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the Moon and other celestial bodies.

Article VIII

A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.

Article IX

In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.

Article X

In order to promote international cooperation in the exploration and use of outer space, including the Moon and other celestial bodies, in conformity with the purposes of this Treaty, the States Parties to the Treaty shall consider on a basis of equality any requests by other States Parties to the Treaty to be afforded an opportunity to observe the flight of space objects launched by those States.

The nature of such an opportunity for observation and the conditions under which it could be afforded shall be determined by agreement between the States concerned.

Article XI

In order to promote international cooperation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.

Article XII

All stations, installations, equipment and space vehicles on the Moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity. Such representatives shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited.

Article XIII

The provisions of this Treaty shall apply to the activities of States Parties to the Treaty in the exploration and use of outer space, including the Moon and other celestial bodies, whether such activities are carried on by a single State Party to the Treaty or jointly with other States, including cases where they are carried on within the framework of international intergovernmental organizations.

Any practical questions arising in connection with activities carried on by international intergovernmental organizations in the exploration and use of outer space, including the Moon and other celestial bodies, shall be resolved by the States Parties to the Treaty either with the appropriate international organization or with one or more States members of that international organizations which are Parties to this Treaty.

Article XIV

1. This Treaty shall be open to all States for signature. Any State which does not sign this Treaty before its entry into force, in accordance with paragraph 3 of this article, may accede to it at any time.

2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

3. This Treaty shall enter into force upon the deposit of instruments of ratification by five Governments, including the Governments designated as Depositary Governments under this Treaty.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification of an accession to this Treaty, the date of its entry into force and other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article XV

Any State Party to the Treaty may propose amendments to this Treaty. Amendments shall enter into force for each State Party to the Treaty accepting the amendments upon their acceptance by a majority of the States Parties to the Treaty and thereafter for each remaining State Party to the Treaty on the date of acceptance by it.

Article XVI

Any State Party to the Treaty may give notice of its withdrawal from the Treaty one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article XVII

This Treaty, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in triplicate, at the cities of London, Moscow and Washington, the twenty-seventh day of January, one thousand nine hundred and sixty-seven.

APPENDIX II

Guidelines for appropriate types of confidence-building measures and for the implementation of such measures on a global or regional level a/

The Commission has elaborated the subsequent guidelines for appropriate types of confidence-building measures for the consideration of the General Assembly at its forty-first session, in keeping with resolution 39/63 E of 12 December 1984.

The text of the guidelines is agreed on all counts.

The Commission wishes to draw particular attention to paragraph 1.2.5 of the guidelines, where it is emphasized that the accumulation of relevant experience with confidence-building measures may necessitate the further development of the text at a later time, should the General Assembly so decide.

In elaborating the guidelines, all delegations were aware, notwithstanding the high significance and role of confidence-building measures, of the primary importance of disarmament measures and the singular contribution only disarmament can make to the prevention of war, in particular nuclear war. Some delegations would have wished to see the criteria and characteristics of a regional approach to confidence-building measures spelt out in greater detail.

1. General considerations

1.1 Frame of reference

1.1.1 The present guidelines for confidence-building measures have been drafted by the Disarmament Commission in pursuance of resolution 37/100 D adopted by consensus by the General Assembly, in which the Disarmament Commission was requested "to consider the elaboration of guidelines for appropriate types of confidence-building measures and for the implementation of such measures on a global or regional level" and of resolutions 38/73 A and 39/63 E, in which it was asked to continue and to conclude its work, and was further requested to submit to the Assembly at its forty-first session a report containing such guidelines.

1.1.2 In elaborating the guidelines the Disarmament Commission took into account, inter alia, the following United Nations documents: the Final Document of the Tenth Special Session of the General Assembly, the first special session devoted to disarmament (resolution S-10/2); the relevant resolutions adopted by consensus by the General Assembly (resolutions 34/87 B, 35/156 B, 36/57 F, 37/100 D and 38/73); the replies received from Governments informing the Secretary-General of their views and experiences regarding confidence-building measures; b/ the Comprehensive Study on Confidence-building Measures c/ by a Group of Governmental Experts; the proposals made by individual countries at the twelfth special session of

the General Assembly; d/ the second special session devoted to disarmament, as well as the views of delegations as expressed during the annual sessions of the Disarmament Commission in 1983, 1984 and 1986 and reflected in the relevant documents of those sessions.

1.2 General political context

1.2.1 These guidelines have been elaborated at a time when it is universally felt that efforts to heighten confidence among States are particularly pertinent and necessary. There is a common concern about the deterioration of the international situation, the continuous recourse to the threat or use of force and the further escalation of the international arms build-up, with the concomitant rise in instabilities, political tensions and in mistrust, and the heightened perception of the danger of war, both conventional and nuclear. At the same time, there is a growing awareness of the unacceptability of war in our time, and of the interdependence of the security of all States.

1.2.2 This situation calls for every effort by the international community to take urgent action for the prevention of war, in particular nuclear war - in the language of the Final Document of the Tenth Special Session, a threat whose removal is the most acute and urgent task of the present day - and for concrete measures of disarmament - to prevent an arms race in space and to terminate it on Earth, to limit, reduce and eventually eliminate nuclear arms and enhance strategic stability - but also for efforts to reduce political confrontation and to establish stable and cooperative relationships in all fields of international relations.

1.2.3 In this context, a confidence-building process embracing all these fields has become increasingly important. Confidence-building measures, especially when applied in a comprehensive manner, have a potential to contribute significantly to the enhancement of peace and security and to promote and facilitate the attainment of disarmament measures.

1.2.4 This potential is at present already being explored in some regions and subregions of the world, where the States concerned - while remaining mindful of the need for global action and for disarmament measures - are joining forces to contribute, by the elaboration and implementation of confidence-building measures, to more stable relations and greater security, as well as the elimination of outside intervention and enhanced cooperation in their areas.

The present guidelines have been drafted with these significant experiences in mind, but they also purport to provide further support to these and other endeavours on the regional and

global level. They do not, of course, exclude the simultaneous application of other security-enhancing measures.

1.2.5 These guidelines are part of a dynamic process over time. While they are designed to contribute to a greater usefulness and wider application of confidence-building measures, the accumulation of relevant experience may, in turn, necessitate the further development of the guidelines at a later time, should the General Assembly so decide.

1.3 Delimitation of the subject

1.3.1 Confidence-building measures and disarmament

1.3.1.1 Confidence-building measures must be neither a substitute nor a precondition for disarmament measures nor divert attention from them. Yet their potential for creating favourable conditions for progress in this field should be fully utilized in all regions of the world, in so far as they may facilitate and do not impair in any way the adoption of disarmament measures.

1.3.1.2 Effective disarmament and arms limitation measures which directly limit or reduce military potential have particularly high confidence-building value and, among these measures, those relating to nuclear disarmament as especially conducive to confidence-building.

1.3.1.3 The provisions of the Final Document of the Tenth Special Session relating to disarmament, particularly nuclear disarmament, also have a high confidence-building value.

1.3.1.4 Confidence-building measures may be worked out and implemented independently in order to contribute to the creation of favourable conditions for the adoption of additional disarmament measures, or, no less important, as collateral measures in connection with specific measures of arms limitation and disarmament.

1.3.2 Scope of confidence-building measures: military and non-military measures

1.3.2.1 Confidence reflects a set of interrelated factors of a military as well as of a non-military character, and a plurality of approaches is needed to overcome fear, apprehension and mistrust between States and to replace them by confidence.

1.3.2.2 Since confidence relates to a wide spectrum of activities in the interaction among States, a comprehensive approach is indispensable and

confidence-building is necessary in the political, military, economic, social, humanitarian and cultural fields. These should include removal of political tensions, progress towards disarmament, reshaping of the world economic system and the elimination of racial discrimination, of any form of hegemony and domination and of foreign occupation. It is important that in all these areas the confidence-building process should contribute to diminishing mistrust and enhancing trust among States by reducing and eventually eliminating potential causes for misunderstanding, misinterpretation and miscalculation.

1.3.2.3 Notwithstanding the need for such a broad confidence-building process, and in accordance with the mandate of the Disarmament Commission, the main focus of the present guidelines for confidence-building measures relates to the military and security field, and the guidelines derive their specificity from these aspects.

1.3.2.4 In many regions of the world economic and other phenomena touch upon the security of a country with such immediacy that they cannot be disassociated from defence and military matters. Concrete measures of a non-military nature that are directly relevant to the national security and survival of States are therefore fully within the focus of the guidelines. In such cases military and non-military measures are complementary and reinforce each other's confidence-building value.

1.3.2.5 The appropriate mixture of different types of concrete measures should be determined for each region, depending on the perception of security and of the nature and levels of existing threats, by the countries of the regions themselves.

2. Guidelines for appropriate types of confidence-building measures and for their implementation

2.1 Principles

2.1.1 Strict adherence to the Charter of the United Nations and fulfilment of the commitments contained in the Final Document of the Tenth Special Session of the General Assembly (resolution S-10/2), the validity of which had been unanimously and categorically reaffirmed by all Member States at the Twelfth Special Session of the General Assembly, the second special session devoted to disarmament, make a contribution of overriding importance for the preservation of peace and for

ensuring the survival of mankind and the realization of general and complete disarmament under effective international control.

2.1.2 In particular, and as a prerequisite for enhancing confidence among States, the following principles enshrined in the Charter of the United Nations must be strictly observed:

(a) Refraining from the threat or use of force against the territorial integrity or political independence of any State;

(b) Non-intervention and non-interference in the internal affairs of States;

(c) Peaceful settlement of disputes;

(d) Sovereign equality of States and self-determination of peoples.

2.1.3 The strict observance of the principles and priorities of the Final Document of the Tenth Special Session is of particular importance for enhancing confidence among States.

2.2 Objectives

2.2.1 The ultimate goal of confidence-building measures is to strengthen international peace and security and to contribute to the prevention of all wars, in particular nuclear war.

2.2.2 Confidence-building measures are to contribute to the creation of favourable conditions for the peaceful settlement of existing international problems and disputes and for the improvement and promotion of international relations based on justice, cooperation and solidarity; and to facilitate the solution of any situation which might lead to international friction.

2.2.3 A major goal of confidence-building measures is the realization of universally recognized principles, particularly those contained in the Charter of the United Nations.

2.2.4 By helping to create a climate in which the momentum towards a competitive arms build-up can be reduced and in which the importance of the military element is gradually diminished, confidence-building measures should in particular facilitate and promote the process of arms limitation and disarmament.

2.2.5 A major objective is to reduce or even eliminate the causes of mistrust, fear, misunderstanding and miscalculation with regard to relevant military activities and intentions of other States, factors which may generate the perception of an impaired

security and provide justification for the continuation of the global and regional arms build-up.

2.2.6 A centrally important task of confidence-building measures is to reduce the dangers of misunderstanding or miscalculation of military activities, to help to prevent military confrontation as well as covert preparations for the commencement of a war, to reduce the risk of surprise attacks and of the outbreak of war by accident; and thereby, finally, to give effect and concrete expression to the solemn pledge of all nations to refrain from the threat or use of force in all its forms and to enhance security and stability.

2.2.7 Given the enhanced awareness of the importance of compliance, confidence-building measures may serve the additional objective of facilitating verification of arms limitation and disarmament agreements.

In addition, strict compliance with obligations and commitments in the field of disarmament and cooperation in the elaboration and implementation of adequate measures to ensure the verification of such compliance - satisfactory to all parties concerned and determined by the purposes, scope and nature of the relevant agreement - have a considerable confidence-building effect of their own.

Confidence-building measures cannot, however, supersede verification measures, which are an important element in arms limitation and disarmament agreements.

2.3 Characteristics

2.3.1 Confidence in international relations is based on the belief in the cooperative disposition of other States. Confidence will increase to the extent that the conduct of States, over time, indicates their willingness to practice non-aggressive and cooperative behaviour.

2.3.2 Confidence-building requires a consensus of the States participating in the process. States must therefore decide freely and in the exercise of their sovereignty whether a confidence-building process is to be initiated and, if so, which measures are to be taken and how the process is to be pursued.

2.3.3 Confidence-building is a step-by-step process of taking all concrete and effective measures which express political commitments and are of military significance and which are designed to make progress in strengthening confidence and security to lessen tension and assist in arms limitation and disarmament. At each stage of this process States must be able to measure and assess the results achieved. Verification of

compliance with agreed provisions should be a continuing process.

2.3.4 Political commitments taken together with concrete measures giving expression and effect to those commitments are important instruments for confidence-building.

2.3.5 Exchange or provision of relevant information on armed forces and armaments, as well as on pertinent military activities, plays an important role in the process of arms limitation and disarmament and of confidence-building. Such an exchange or provision could promote trust among States and reduce the occurrence of dangerous misconceptions about the intentions of States. Exchange or provision of information in the field of arms limitation, disarmament and confidence-building should be appropriately verifiable as provided for in respective arrangements, agreements or treaties.

2.3.6 A detailed universal model being obviously impractical, confidence-building measures must be tailored to specific situations. The effectiveness of a concrete measure will increase the more it is adjusted to the specific perceptions of threat or the confidence requirements of a given situation or a particular region.

2.3.7 If the circumstances of a particular situation and the principle of undiminished security allow, confidence-building measures could, within a step-by-step process where desirable and appropriate, go further and (though not by themselves capable of diminishing military potentials) limit available military options.

2.4 Implementation

2.4.1 In order to optimize the implementation of confidence-building measures, States taking, or agreeing to, such measures should carefully analyse, and identify with the highest possible degree of clarity, the factors which favourably or adversely affect confidence in a specific situation.

2.4.2 Since States must be able to examine and assess the implementation of, and to ensure compliance with, a confidence-building arrangement, it is indispensable that the details of the established confidence-building measures should be defined precisely and clearly.

2.4.3 Misconceptions and prejudices, which may have developed over an extended period of time, cannot be overcome by a single application of confidence-building measures. The seriousness, credibility and reliability of a State's commitment to confidence-building, without which the confidence-building process cannot be successful, can be demonstrated only by consistent implementation over time.

2.4.4 The implementation of confidence-building measures should take place in such a manner as to ensure the right of each State to undiminished security, guaranteeing that no individual State or group of States obtains advantages over others at any stage of the confidence-building process.

2.4.5 The building of confidence is a dynamic process: experience and trust gained from the implementation of early largely voluntary and militarily less significant measures can facilitate agreement on further and more far-reaching measures.

The pace of the implementation process both in terms of timing and scope of desirable measures depends on prevailing circumstances. Confidence-building measures should be as substantial as possible and effected as rapidly as possible. While in a specific situation the implementation of far-reaching arrangements at an early stage might be attainable, it would normally appear that a gradual step-by-step process is necessary.

2.4.6 Obligations undertaken in agreements on confidence-building measures must be fulfilled in good faith.

2.4.7 Confidence-building measures should be implemented on the global as well as on regional levels. Regional and global approaches are not contradictory, but rather complementary and interrelated. In view of the interaction between global and regional events, progress on one level contributes to advancement on the other level; however, one is not a pre-condition for the other.

In considering the introduction of confidence-building measures in particular regions, the specific political, military and other conditions prevailing in the region should be fully taken into account. Confidence-building measures in a regional context should be adopted on the initiative and with the agreement of the States of the region concerned.

2.4.8 Confidence-building measures can be adopted in various forms. They can be agreed upon with the intention of creating legally binding obligations, in which case they represent international treaty law among parties. They can, however, also be agreed upon through politically binding commitments. Evolution of politically binding confidence-building measures into obligations under international law can also be envisaged.

2.4.9 For the assessment of progress in the implementing action of confidence-building measures, States should, to the extent possible and where appropriate, provide for procedures and mechanisms for review and evaluation. Where possible, time-frames could be agreed to facilitate this assessment in both quantitative and qualitative terms.

2.5 Development, prospects and opportunities

2.5.1 A very important qualitative step in enhancing the credibility and reliability of the confidence-building process may consist in strengthening the degree of commitment with which the various confidence-building measures are to be implemented; this, it should be recalled, is also applicable to the implementation of commitments undertaken in the field of disarmament. Voluntary and unilateral measures should, as early as appropriate, be developed into mutual, balanced and politically binding provisions and, if appropriate, into legally binding obligations.

2.5.2 The nature of a confidence-building measure may gradually be enhanced to the extent that its general acceptance as the correct pattern of behaviour grows. As a result, the consistent and uniform implementation of a politically binding confidence-building measure over a substantial period of time, together with the requisite opinio iuris, may lead to the development of an obligation under customary international law. In this way, the process of confidence-building may gradually contribute to the formation of new norms of international law.

2.5.3 Statements of intent and declarations, which in themselves contain no obligation to take specific measures, but have the potential to contribute favourably to an atmosphere of greater mutual trust, should be developed further by more concrete agreements on specific measures.

2.5.4 Opportunities for the introduction of confidence-building measures are manifold. The following compilation of some of

the main possibilities may be of assistance to States wishing to define what might present a suitable opportunity for action.

2.5.4.1 A particular need for confidence-building measures exists at times of political tension and crises, where appropriate measures can have a very important stabilizing effect.

2.5.4.2 Negotiations on arms limitation and disarmament can offer a particularly important opportunity to agree on confidence-building measures. As integral parts of an agreement itself or by way of supplementary agreements, they can have a beneficial effect on the parties' ability to achieve the purposes and goals of their particular negotiations and agreements by creating a climate of cooperation and understanding, by facilitating adequate provisions for verification acceptable to all the States concerned and corresponding to the nature, scope and purpose of the agreement, and by fostering reliable and credible implementation.

2.5.4.3 A particular opportunity might arise upon the introduction of peace-keeping forces, in accordance with the purposes of the United Nations Charter, into a region or on the cessation of hostilities between States.

2.5.4.4 Review conferences of arms limitation agreements might also provide an opportunity to consider confidence-building measures, provided those measures are in no way detrimental to the purposes of the agreements; the criteria of such action to be agreed upon by the parties to the agreements.

2.5.4.5 Many opportunities exist in conjunction with agreements among States in other areas of their relations, such as the political, economic, social and cultural fields, for example in the case of joint development projects, especially in frontier areas.

2.5.4.6 Confidence-building measures, or at least a statement of intent to develop them in the future, could also be included in any other form of political declaration on goals shared by two or more States.

2.5.4.7 Since it is especially the multilateral approach to international security and disarmament issues which enhances international confidence, the United Nations can contribute to increasing confidence by playing its central role in the field of international peace, security and disarmament. Organs of the United Nations and other international organizations could

participate in encouraging the process of confidence-building, as appropriate. In particular the General Assembly and the Security Council - their tasks in the field of disarmament proper notwithstanding - can further this process by adopting decisions and recommendations containing suggestions and requests to States to agree on and implement confidence-building measures. The Secretary-General, in accordance with the Charter of the United Nations, could also contribute significantly to the process of confidence-building by suggesting specific confidence-building measures or by providing his good offices, particularly at times of crises, in promoting the establishment of certain confidence-building procedures.

2.5.4.8 In accordance with item IX of its established agenda - the so-called dialogue - and without prejudice to its negotiating role in all areas of its agenda, the Conference on Disarmament could identify and develop confidence-building measures in relation to agreements on disarmament and arms limitation under negotiation in the Conference.

Notes

a/ Official Records of the General Assembly, Fifteenth Special Session, Supplement No. 3 (A/S-15/3), pp. 21-32.

b/ A/34/416 and Add.1-3; A/35/397.

c/ United Nations publication, Sales No. E.82.IX.3.

d/ See A/S-12/AC.1/59.

APPENDIX III

Status of multilateral treaties relating to activities in outer space a/

TREATIES	TITLE
PTBT	Partial Test Ban Treaty (1963)
OST	Outer Space Treaty (1967)
ARRA	Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968)
Lib. Conv.	Liability Convention (1972)
Regis. Con.	Registration Convention (1975)
ITU	International Telecommunication Convention (1992) b/
ENMOD Conv.	Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification Techniques (1977)
Moon Agr.	Moon Agreement (1979)

ABBREVIATIONS

a	Ratification, accession, succession (no reservations, clarifications or statements)
b	Signature; no ratification
c	Declaration of acceptance

Status of multilateral treaties relating to activities in outer space

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Afghanistan	a	a				b	a	
Albania	a	a				b		
Algeria	b			b		b	a	
Antigua and Barbuda	a	a	a	a	a		a	
Argentina	a	a	a	a	b	b	a	
Australia	a	a	a	a	a	b	a	a
Austria	a	a	a	b	a	b	a	a
Bahamas	a	a	a			b		
Bahrain						b		
Bangladesh	a	a					a	
Barbados		a	a			b		
Belgium	a	a	a	a	a	b		
Benin	a	a		a		b	a	
Bhutan	a					b		
Bolivia	a	b	b				b	
Botswana	a	b	a	a		b		
Brazil	a	a	a	a		b	a	
Brunei Darussalam						b		

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Bulgaria	a	a	a	a	a	b	a	
Burkina Faso	b	a				b		
Burundi	b	b		b	b	b		
Belarus	a	a	a	a	a	b		
Cambodia				b				
Cameroon	b	b	a			b		
Canada	a	a	a	a	a	b	a	
Cape Verde	a					b	a	
Central African Republic	a	b		b		b		
Chad	a					b		
Chile	a	a	a	a	a	b		a
China		a	a	a	a	b		
Colombia	a	b	b	b		b		
Comoros						b		
Costa Rica	a		b	b				
Côte d'Ivoire	a					b		
Croatia						b		
Cuba		a	a	a	a	b	a	
Cyprus	a	a	a	a	a	b	a	
Czech and Slovak Federal Republic c/	a	a	a	a	a	b	a	

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Democratic People's Republic of Korea						b	a	
Denmark	a	a	a	a	a	b	a	
Djibouti						b		
Dominican Republic	a	a	b	a				
Ecuador	a	a	a	a				
Egypt	a	a	a	b		b	a	
El Salvador	a	a	a	b		b		
Equatorial Guinea	a	a						
Estonia						b		
Ethiopia	b	b				b	b	
Fiji	a	a	a	a		b		
Finland	a	a	a	a		b	a	
France		a	a	a	a	b		b
Gabon	a		a	a		b		
Gambia	a	b	a	b		b		
Germany	a	a	a	a	a	b	a	
Ghana	a	b	b	b		b	a	
Greece	a	a	a	a		b	a	
Grenada						b		
Guatemala	a			b			a	b

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Guinea						b		
Guinea-Bissau	a	a	a					
Guyana		b	a					
Haiti	b	b	b	b				
Holy See		b				b	b	
Honduras	a	b		b		b		
Hungary	a	a	a	a	a	b	a	
Iceland	a	a	a	b		b	a	
India	a	a	a	a	a	b	a	b
Indonesia	a	b				b		
Iran, Islamic Republic of	a	b	a	a	b	b	b	
Iraq	a	a	a	a			b	
Ireland	a	a	a	a		b	a	
Israel	a	a	a	a		b		
Italy	a	a	a	a		b	a	
Jamaica	a	a	b			b		
Japan	a	a	a	a	a	b	a	
Jordan	a	b	b	b		b		
Kenya	a	a		a		b		
Kuwait	a	a	a	a		b	a	

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Laos	a	a	a	a			a	
Latvia						b		
Lebanon	a	a	a	b		b	b	
Lesotho		b	b			b		
Liberia	a					b	b	
Libyan Arab Jamahiriya	a	a						
Liechtenstein				a		b		
Lithuania						b		
Luxembourg	a	b	b	a		b	b	
Madagascar	a	a	a			b		
Malawi	a					b	a	
Malaysia	a	b	b			b		
Maldives			a					
Mali	b	a		a		b		
Malta	a		b	a		b		
Mauritania	a					b		
Mauritius	a	a						
Mexico	a	a	a	a	a	b		a
Monaco			b			b		
Mongolia	a	a	a	a	a	b	a	

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Morocco	a	a	a	a		b	b	b
Myanmar	a	a	b			b		
Nepal	a	a	a	b		b		
Netherlands	a	a	a	a	a	b	a	a
New Zealand	a	a	a	a		b	a	
Nicaragua	a	b	b	b	b		b	
Niger	a	a	a	a	a	b		
Nigeria	a	a	a			b		
Norway	a	a	a	b		b	a	
Oman				b		b		
Pakistan	a	a	a	a	a	b	a	a
Panama	a	b		a		b		
Papua New Guinea	a	a	a	a		b	a	
Paraguay	b						a	
Peru	a	a	a	b	a			b
Philippines	a	b	b	b		b		a
Poland	a	a	a	a	a	b	a	
Portugal	b		a			b	b	
Qatar						b		
Republic of Korea	a	a	a	a	a	b	a	

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Republic of Moldova						b		
Romania	a	a	a	a		b	a	b
Russian Federation	a	a	a	a	a	b	a	
Rwanda	a	b	b	b				
San Marino	a	a	a			b		
Sao Tome and Principe							a	
Saudi Arabia		a		a		b		
Senegal	a		b	a		b		
Seychelles	a	a	a	a	a			
Sierra Leone	a	a	b	b			b	
Singapore	a	a	a	a	b	b		
Slovenia						b		
Solomon Islands							a	
Somalia	b	b	b					
South Africa	a	a	a	b				
Spain	a	a		a	a	b	a	
Sri Lanka	a	a		a		b	a	
Sudan	a					b		
Suriname						b		
Swaziland	a		a			b		

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Sweden	a	a	a	a	a	b	a	
Switzerland	a	a	a	a	a	b	a	
Syrian Arab Republic	a	a	a	a		b	b	
Thailand	a	a	a			b		
Togo	a	a		a				
Tonga	a	a	a					
Trinidad and Tobago	a	b						
Tunisia	a	a	a	a		b	a	
Turkey	a	a	b			b	b	
Uganda	a	a					b	
Ukraine	a	a	a	a	a	b	a	
United Arab Emirates						b		
United Kingdom of Great Britain and Northern Ireland	a	a	a	a	a	b	a	
United Republic of Tanzania	a			b		b		
United States of America	a	a	a	a	a	b	a	
Uruguay	a	a	a	a	a	b		a
Venezuela	a	a	b	a		b		
Viet Nam		a				b	a	
Western Samoa	a							
Yemen	a	a	a			b	a	

Entity	PTBT	OST	ARRA	Liab. Conv.	Regis. Conv.	ITU Conv.	ENMOD Conv.	Moon Agr.
Yugoslavia	a	b	a	a	a			
Zaire	a	b	b	b			b	
Zambia	a	a	a	a		b		
Zimbabwe						b		
Organizations								
European Space Agency				c	c			c
European Telecommunication Satellite Organization					c			

a/ Signatories and Parties as of 1 January 1993.

b/ The States Parties listed in the table are those which have signed the Constitution and Convention of the International Telecommunication Union (Geneva, 1992). The Nairobi Convention (1982), which is still in force, has 128 States Parties. The Nice Constitution and Convention were ratified or accepted only by 22 States.

c/ As of 1 January 1993, two independent countries were named the Czech Republic and the Slovak Republic.

Selected bibliography on technical, political and legal aspects of outer space activities

Note by the Secretariat

1. In the course of the discussion of the Group of Governmental Experts to Carry Out a Study on the Application of Confidence-Building Measures in Outer Space, the Secretariat was asked to provide an illustrative bibliography on technical and legal aspects of outer space activities to serve as a preliminary listing of source materials and as a first step in a process of data collection.

2. There is already a large quantity of published materials on the subject of outer space and the number is growing rapidly. While every effort has been made to present a bibliographical selection that is representative of various viewpoints on the subject, this survey should not be considered as an exhaustive listing of the publications available on the issue of outer space technology and legal aspects of States' activities in outer space. In particular, this preliminary listing does not adequately reflect materials published in languages other than English.

3. The views expressed by the various authors in the publications listed in the present document are solely their own. Inclusion in this select bibliographical listing does not convey any endorsement of the contents of the publications.

1. Articles

Adams, Peter, "New group to examine proliferation of satellites", EW Technology, Defense News, 5 February 1990, p. 33.

Adams, Peter, "U.S., Soviets edge closer to rewritten ABM Treaty at defense and space talks", Defense News, 21 August 1989.

"Administration sets policy on Landsat continuity", LANDSAT DATA USERS' NOTES, Earth Observation Satellite Company, vol. 7, No. 1, Spring 1992, p. 4.

"Advanced missile warning satellite evolved from smaller spacecraft", Aviation Week and Space Technology, 20 January 1989, p. 45.

"AF Weapons Laboratory examines laser ASAT questions", SDI Monitor, 14 September 1990, pp. 209-211.

Aftergood, Steve, David W. Hafemeister, Oleg F. Prilutsky, Joel R. Primack and Stanislav N. Rodionov, "Nuclear power in space", Scientific American, June 1991, vol. 264, No. 6, pp. 42-47.

"Air Force wants to update spacetrack", Electronics, 6 January 1977, p. 34.

"Allied milspace", Military Space, 19 November 1990, p. 5.

"Allies, US explore space cooperation", Military Space, 19 November 1990, pp. 1-3.

Anson, Peter, "The Skynet Telecommunication Programme", Colloque Activités Spaciales Militaires (Association Aeronautique et Astronautique de France, Gap, Imprimerie Louis-Jean, mai 1989), pp. 143-159.

Anthony, Ian (ed.), "The Co-ordinating Committee on Multilateral Export Controls", Arms Export Regulations (Oxford University Press: Stockholm International Peace Research Institute, 1991), pp. 207-211.

_____, "The missile technology control regime", Arms Export Regulations (Oxford University Press: Stockholm International Peace Research Institute, 1991), pp. 219-227.

"Argentina develops Condor solid-propellant rocket", Aviation Week and Space Technology, June 1985, p. 61.

Asker, James R., "U.S. draws blueprints for first lunar base", Aviation Week and Space Technology, 31 August 1992, pp. 47-51.

Aubay, P. H., J. B. Nocaudie, "Surveillance terrestre", Colloque Activités Spaciales Militaires (Association Aeronautique et Astronautique de France, Gap, Imprimerie Louis-Jean, mai 1989), pp. 143-159.

"Australian-Asian cooperation increases in telecommunications", Space Policy, vol. 8, 1 February 1992, p. 96.

"Australian defence may launch own satellite", C and C Space and Satellite Newsletter, 8 June 1990, pp. 1-2.

"Avco puts together laser radar for strategic defense", Space News, 30 July 1990.

Ball, Desmond, Australia's Secret Space Programmes, Canberra Paper on Strategy and Defence No. 43 (Canberra, Strategic and Defence Studies Centre, 1988), 103 pp.

_____ and Helen Wilson (eds.), Australia and Space (Strategic and Defence Studies Centre, Canberra, 1992).

Badurkin, V., "Mukachev radar facility prompts local protests", FBIS-Sov, 7 March 1990, pp. 2-3.

Bates, Kelly, "SDIO's Cooper says U.S. could deploy strategic defense system for $40 billion", Inside the Pentagon, 20 December 1990, pp. 10-11.

Beatty, J. Kelly, "The GEODSS difference", Sky and Telescope, May 1982, pp. 469-473.

Bennet, Ralph, "Brilliant pebbles", Reader's Digest, September 1989, pp. 128-132.

Bernard Raab, "Nuclear-powered infrared surveillance satellite study", Inter-Society Energy Conversion Engineering Conference, 1977, Fairchild Space and Electronics Company, Germantown, Maryland.

Bertotti, Bruno and Luciano Anselmo, The Problem of Debris and Military Activities in Space, Permanent Representative of Italy, Conference on Disarmament, 6 August 1991.

Beusch, J., et al, "NASA debris environment characterization with the haystack radar", AIAA Paper 90-1346, 16 April 1990.

Bhatia, A., "India's space program - cause for concern?", Asian Survey, October 1985, p. 1017.

Bhatt, S., "Space law in the 1990s", International Studies, vol. 26, No. 4, October 1989, pp. 323-335.

Bobb, Dilip and Amarnath K. Menon, "Chariot of fire", India Today, 15 June 1989, pp. 28-32.

Bosco, Joseph A., "International law regarding outer space - an overview", Journal of Air Law and Commerce, Spring 1990, pp. 609-651.

Boulden, Jane, "Phase I of the Strategic Defense Initiative: current issues, arms control and Canadian national security", Issue Brief, Canadian Centre for Arms Control and Disarmament, No. 12, August 1990.

Bourely, Michael G., "La production du lanceur Ariane", Annals of Air and Space Law, vol. vi 1981, pp. 279-314.

Brankli, Hank, "Weather satellite photos and the Vietnam War", Naval History, Spring 1991, pp. 66-68.

"Brazil plans to launch its own satellites in the 1990s", Aviation Week and Space Technology, 9 July 1984, p. 60.

"Brazil's space age begins", Interavia, December 1984, No. 12.

"Brazil - aiming for self-sufficiency in orbit", Space World, October 1985, p. 29.

Brooks, Charles D., "S.D.I.: a new dimension for Israel", Journal of Social, Political and Economic Studies, 11(4), Winter 1986, pp. 341-348.

"Canada studies PAXSATS for arms control", Military Space, 31 August 1987, pp. 1-3.

Chandrashekar, S., "An assessment of Pakistan's missile programme", Unpublished, 1992.

_____, "Export controls and proliferation: an Indian perspective, Forthcoming, 1992.

_____, "Missile technology control and the Third World", Space Policy, November 1990, pp. 278-284.

Charles, Dan, "Spy satellites: entering a new era", Science, 24 March 1989, pp. 1541-1543.

Chayes and Chayes, "Testing and development of 'exotic' systems under the ABM Treaty: the great reinterpretations caper", Harvard Law Review, No. 1956, 1986.

Chen, Yanping, "China's space policy: a historical review", Space Policy, vol. 7, No. 2, May 1991, pp. 116-128.

Chen, Zhiqiang, "Sun Jiadong talking about China's space technology", Military World, Jan./Feb. 1990, pp. 34-38.

"China/Brazil space talks", Aerospace Daily, 10 August 1987, p. 219.

Chosh, S. K., "India's space program and its military implications", Agence Defence Journal, September 1981.

Cleminson, Frank R. and Pericles Gasparini Alves, "Space weapon verification: a brief appraisal", Verification of Disarmament or Limitation of Armaments: Instruments, Negotiations, Proposals, Serge Sur (ed.) UNIDIR, New York, 1992, pp. 177-206.

_____, "PAXSAT and progress in arms control", Space Policy, May 1988, pp. 97-102.

Clark, Phillip, "Soviet worldwide ELINT satellites", Jane's Soviet Intelligence Review, July 1990, pp. 330-332.

Cohen, William S., "Limited defences under a modified ABM Treaty", Disarmament, vol. XV, No. 1, 1992, pp. 13-27.

Condom, P., "Brazil aims for self-sufficiency in space", Interavia, January 1984, No. 1, pp. 99-101.

Corradini, Alessandro, "Consideration of the question of international arms transfer by the United Nations", by Transparency in international transfers, Disarmament Topical Paper 3, United Nations Department for Disarmament Affairs, New York: United Nations publication, 1990.

Couston, M., "Vers un droit des stations spatiales", Revue française du droit aerien et spatial, 1990, No. 1.

Covault, Craig, "New missile warning satellite to be launched on the first Titan 4", Aviation Week and Space Technology, 20 January 1989, pp. 34-40.

_____, "USAF missile warning satellites providing 90-sec. Scud attack alert", Aviation Week and Space Technology, 21 January 1990, pp. 60-61.

_____, "Soviet military space operations developing longer life satellites", Aviation Week and Space Technology, 9 April 1990, pp. 44-49.

_____, "Maui optical station photographs external tank reentry breakup", Aviation Week and Space Technology, 11 June 1990, pp. 52-53.

_____, "Russia seeks joint space test to build military cooperation", Aviation Week and Space Technology, 9 March 1992, pp. 18-19.

"Congress splits on milspace budget", Military Space, 25 September 1989, p. 2.

Cox, David, et al, "Security cooperation in the Arctic: a Canadian response to Murmansk", Canadian Centre for Arms Control and Disarmament, 24 October 1989.

"Crisis shows need for better tactical satellite communications", Aerospace Daily, 31 January 1991, p. 174.

Daly, P., "GLONASS status", Aviation Week and Space Technology, 14 September 1987, p. 108.

Danchik, Robert, et al, "The Navy navigation satellite system (TRANSIT)", Johns Hopkins APL Technical Digest, vol. 11, Nos. 1 and 2, 1990, pp. 97-101.

de Briganti, Giovanni, "West Germany reverses stance on reconnaissance satellites", Space News, 9 April 1990.

_____, "Budget reveals slower growth for military space programs", Defense News, 3 December 1990, p. 14.

de Selding, Peter, "Defense minister says no to French radar spy satellite", Space News, 12 March 1990.

_____, "UK Minister balks at call for European spy satellite", Space News, 16 July 1990, pp. 1, 20.

DeVere, G. T. and N. L. Johnson, "The NORAD space network", Spaceflight, July 1985, vol. 27, pp. 306-309.

Domke, M., "Kostendämpfungsstrategie: integration ziviler und militärischer produktion neuer technologien", Informationsdienst Wissenschaft und Frieden, 4/1991, pp. 26-31.

Du, Shuhua, "The outer space and the moon treaties", Verification of current disarmament and arms limitation agreements: ways, means and practices, UNIDIR, New York: United Nations Publication, 1991.

Dudney, Robert S., "The force forms up", Air Force Magazine, February 1992, p. 23.

"European space industry eyes spy sats", Military Space, 23 April 1990, pp. 5-6.

"Expert says no blessing for SDI deployment", FBIS-SOV, 91-023, 21 October 1991, p. 1.

"Experts map out European satellite plan", Military Space, 9 April 1990, p. 7.

Falkenheim, Peggy L., "Japan and arms control: Tokyo's response to SDI and INF", Aurora Papers, No. 6, Ontario: The Canadian Centre for Arms Control and Disarmament, 1987.

Finney, A. T., "Tactical uses of the DSCS III communications system", in NATO AGARD (Advisory Group for Aerospace Research and Development), Tactical Applications of Space Systems, Avionics Panel Symposium 16-19 October 1989 (AGARD-CP-460, NTIS N90-27438).

Foley, Theresa, "Raytheon proposes rail-mobile radar for midcourse SDI sensing", Aviation Week and Space Technology, 11 January 1988, pp. 22-24.

"French milspace", Military Space, 5 December 1988, p. 5.

"Foreign milspace", Military Space, 28 January 1991, p. 4.

"French study military recon satellite", Aviation Week and Space Technology, 22 January 1973, p. 15.

Furniss, Tim, "UK studies new military satellite plan", Flight International, 7 October 1989, p. 4.

_____, "Iraq plans to launch two science satellites", Flight International, 21 February 1990, p. 20.

Fujita Yasuki, "Recent developments in the peaceful utilization of space", Mitsubishi Electric Advance, vol. 58, March 1992, p. 1.

"Gadhafi: Libya needs space power", Space News, 25 June 1990, p. 2.

"General Dynamics wins MLV II competition", Aerospace Daily, 4 May 1988, p. 185.6.

George, E. V., "Diffraction-limited imaging of Earth satellites", Energy and Technology Review, August 1991, p. 29.

Gettins, Hal, "Shepherd touching off interservice row", Missiles and Rockets, 7 March 1960, pp. 21-28.

Gilmartin, Trish, "Pentagon Advisory Panel Chairman urges gradual evolutionary approach to SDI", Defense News, 25 July 1988, p. 30.

Goldblat, Josef, "The ENMOD Convention Review Conference", Disarmament, vol. VII, No. 2, Summer 1984, pp. 93-102.

Goure, D., "Soviet radars: the eyes of Soviet defenses", Military Technology, 1988, n. 5, pp. 36-38.

Graham, C. P., "Brazilian space programme - an overview", Space Policy, February 1991, pp. 72-76.

Granger, Ken, Geographic information and remote sensing technologies in the defence of Australia, Strategic and Defence Studies Centre, Canberra, 1992.

Green, David, "UK space policy - a problem of culture", Space Policy, vol. 3, No. 4, November 1987, pp. 277-279.

Grossman, Elaine, "Small and light 'Brilliant Eyes' could replace three SDI surveillance systems", Inside the Army, 28 May 1990, p. 15.

Gullikstad, Espen, "Finland", Arms Export Regulations, Ian Anthony (ed.), Oxford University Press: Stockholm International Peace Research Institute, 1991, pp. 59-63.

_____, "Sweden", Arms Export Regulations, Ian Anthony (ed.), Oxford University Press: Stockholm International Peace Research Institute, 1991, pp. 147-155.

Halperin, Emmanuel, "Israel et les missiles", Politique internationale, No. 44, 1989, pp. 251-256.

He, Changchui, "The development of remote sensing in China", Space Policy, vol. 5, No. 1, February 1989, pp. 65-75.

"Helios to deliver imagery to 3 nations", Military Space, 21 November 1988, pp. 1-3.

Henize, Karl, "Tracking artificial satellites and space vehicles", Advances in Space Science (Academic Press, New York, 1960), vol. 2.

Howell, Andreas, "The challenge of space surveillance", Sky and Telescope, June, 1987, pp. 584-588.

Hua-bao, Lin, "The Chinese recoverable satellite program", 40th Congress of the International Astronautical Federation, 7-12 October 1989, Malaga, Spain, IAF-89-426.

"Hughes, Martin and Rockwell selected for GBI program", SDI Monitor, 31 August 1990, pp. 197-198.

Hughes, Peter C., Satellites harming other satellites, Arms Control Verification Occasional Paper No. 7, Ottawa: Arms Control and Disarmament Division, External Affairs and International Trade, Canada, July 1991.

Hurwitz, Bruce A., "Israel and the law of outer space", Israel Law Review, vol. 22, No. 4, Summer-Autumn 1988, pp. 457-466.

Iguchi, Chikako, "International cooperation in lunar and space development: Japan's role", Space Policy, vol. 8, No. 3, August 1992, pp. 256-267.

"India's space policy", Space Policy, November 1987, pp. 326-334.

"Indigenous missile", Asian Defense Journal, September 1985.

"Industrial view on European space-based verification", Presentation at Dornier, Dornier Deutsche Aerospace, Friedrichshafen, 18 February 1992.

"Industry observer", Aviation Week and Space Technology, 20 June 1977, p. 11.

"International space", Military Space, 9 April 1990, p. 5.

"Invasion tip", Aviation Week and Space Technology, 6 August 1990, p. 15.

"Iraqi space launch more modest than claimed", Flight International, 20 December 1989, p. 4.

"Israeli satellite launch sparks concerns about Middle East missile build-up", Aviation Week and Space Technology, 26 September 1988, p. 21.

"Israel hints at plans to launch spy satellite", Defense News, 11 March 1991, p. 9.

Jackson, P., "Space surveillance satellite catalog maintenance", AIAA Paper 90-1339, 16 April 1990.

"Japan plans satellite", Jane's Defense Weekly, 16 September 1989.

Jasani, Buphendra, "Military space activities", Stockholm International Peace Research Institute Yearbook - 1978 (Taylor and Francis, London, 1978).

_____, et al, "Share satellite surveillance", The Bulletin of the Atomic Scientists, March 1990, pp. 15-16.

_____ and Larsson, Christer, "Security implications of remote sensing", Space Policy, February 1988, p. 48.

Jeambrun, Georges, "La Politique de contrôle des satellites français (1990-2000)", Defense nationale, 43e année, Fevrier 1987, pp. 129-139.

Karp, Aaron, "Space technology in the Third World: commercialization and the spread of ballistic missiles", Space Policy, May 1986, pp. 157-168.

_____, "Ballistic-missile proliferation in the Third World", in World Armament and Disarmament, SIPRI Yearbook 1989, Oxford University Press, pp. 287-318.

_____, "Ballistic missile proliferation", World Armaments and Disarmament, SIPRI Yearbook 1991, Stockholm International Peace Institute, Oxford University Press, 1991, pp. 327-329.

Kawachi, Masao, Toyohiko Ishii and Koichi Ijichi, "The Space Flyer Unit", Mitsubishi Electric Advance, vol. 58, March 1992.

Kenden, A., "Military maneuvers in synchronous orbit", Journal of the British Interplanetary Society, February 1983, V. 36, pp. 88-91.

Kiernan, Vincent, "Air Force begins upgrades to satellite scanning telescope", Space News, 23 July 1990, p. 8.

_____, "Air Force alters GPS signals to aid troops", Space News, 24 September 1990, pp. 1, 35.

_____, "Officials: changing world heightens demand for Milstar", Space News, 8 October 1990, p. 8.

_____, "US Congress slashes Milstar funding, orders shift of system to tactical users", Space News, 22 October 1990, pp. 3, 37.

_____, "DMSP satellite launched to aid troops in Middle East", Space News, 10 December 1990, p. 6.

_____, "Pentagon prepares for ASAT flight testing in 1996", Space News, 5-18 August 1991, p. 23

Kirton, John, "Canadian space policy", Space Policy, vol. 6, No. 1, February 1990, pp. 61-73.

Klass, Philip, "Inmarsat decision pushes GPS to forefront of Civ Nav-Sat field", Aviation Week and Space Technology, 14 January 1991, pp. 34-35.

"Krasnoyarsk radar dismantling in full swing", FBIS-Sov, 10 October 1990, p. 1.

Kubbing, B. W., "The SDI agreement between Bonn and Washington: review of the first four years", Space Policy, August 1990, pp. 231-247.

Langberg, Mike, "Lockheed fights for Milstar as Cold War thaw threatens", San Jose Mercury News, 14 January 1991, pp. 1C, 6C.

Lawler, Andrew, "Taiwan seeks start on $400 million plan to enter space arena", Space News, 19 February 1990, pp. 1, 36.

Lawler, Andrew, "Brazil chafes at missile curbs", Space News, vol. 2, No. 35, 14-20 October 1991, p. 1, 20.

_____, "South Korea plans to build, launch satellites", Space News, 25 June 1990, pp. 1, 20.

"Le traité germano-américain sur l'IDS", Bruxelles: GRIP, No. 103, November 1986.

Lee, Yishane, "South Korea, Taiwan gear up to enter satellite era", Space News, 24 September 1990, p. 7.

Leitenberg, M., "Satellite launchers - and potential ballistic missiles - on the commercial market", Current Research on Peace and Violence, 1981, No. 2, pp. 115-128.

Leopold, George, "Canada, US to begin talks on joint space-based radar", Defense News, 26 June 1989, p. 9.

"Lessons of the Gulf War", Trust and Verify, No. 18, March 1991, pp. 1-2.

"Les satellites d'observation: un instrument européen pour la verification du désarmement", Assemblée de l'Union de l'Europe occidentale, Commission technique et aerospatiale, Colloque, Rome 27, et 28, mars 1990.

"Libya offers to finance Brazilian missile project", Jane's Defence Weekly, 6 February 1988, p. 201.

"Libya wants CSS-2", Flight International, 14 May 1988, p. 6.

Lindsey, George, "Surveillance from space: a strategic opportunity for Canada", Working Paper 44, Canadian Institute for International Peace and Security, June 1992.

Liu Ji-yuan and Min Gui-rong, "The progress of astronautics in China", Space Policy, vol. 3, No. 2, May 1987, pp. 141-147.

"LLNL space imaging tests slated for Maui telescope", Space News, 19 February 1990, p. 12.

Lockwood, Dunbar, "Verifying START: from satellites to suspect sites", Arms Control Today, vol. 20, No. 8, October 1990, pp. 13-19.

Lopes, Roberto, "A satellite deal with Iraq", Space Markets, No. 3, 1989, p. 191.

Lygo, Raymond, "The UK's future in space", Space Policy, vol. 3, No. 4, November 1987, pp. 281-283.

"Magnavox prepares for GPS buildup", Military Space, 25 September 1989, pp. 3-5.

Mahnken, T. G., "Why Third World space systems matter", Orbis, Fall 1991, S. 563-579.

Maitra, Ramtanu, "India's space program: boosting industry", Fusion, 7(4), July/August 1985, pp. 53-58.

Manly, Peter, "Television in amateur astronomy", Astronomy, December 1984, pp. 35-37.

Marov, Mikail Ya., "The new challenge for space in Russia", Space Policy, vol. 8, No. 3, August 1992, pp. 269-279.

Matte, Nicolas, "The treaty banning nuclear weapons tests in the atmosphere, in outer space and under water (10 October 1963) and peaceful uses of outer space", in Annals of Air and Space Law, vol. IX, 1984, pp. 391-414.

McCaughrean, Mark, "Infrared astronomy: pixels to spare", Sky and Telescope, July 1991, pp. 31-35.

Mehmud, Salim, "Pakistan's space programme", Space Policy, vol. 5, No. 8, August 1989, pp. 217-225.

"Meteor 2-20, after being stored on orbit, begins transmission", Aerospace Daily, 19 November 1990, p. 302.

Middleton, B. S. and E. F. Cory, "Australian space policy", Space Policy, vol. 5, No. 1, February 1989, pp. 41-46.

Milhollin, G., "India's missiles - with a little help from our friends", Bulletin of the Atomic Scientists, November 1989, pp. 31-35.

Monserrat Filho, Jose, "Foguetes proibidos", O Globo, 24, June 1992, p. 6.

"MTCR-Update: June-December 1991", Missile Monitor, No. 2, Spring 1992.

NATO AGARD (Advisory Group for Aerospace Research and Development), Tactical Applications of Space Systems, Avionics Panel Symposium, 16-19 October 1989 (AGARD-CP-460, NTIS N90-27438).

Naval Space Command, "NAVSPASUR news release", NAVSPASURINST 5780.1, 11 July 1983.

"Navy satellites approach critical replacement stage", Aviation Week and Space Technology, 21 March 1988, pp. 46, 51.

Norman, Colin, "Cut price plan offered for SDI deployment", Science, 7 October 1988, pp. 24-25.

North American Aerospace Defense Command, "The NORAD space detection and tracking system", Factsheet, 20 August 1982.

Osborne, Freleigh, "PAXSAT space-based remote sensing for arms control verification", IEEE Electro/88, Boston, MA, 10-12 May 1988, Professional Program Session Record 24.

"OSD puts USAF space radar plan on hold, OSD studies nonspace options", Inside the Air Force, 7 December 1990, pp. 10-11.

Ospina, Sylvia, "Project CONDOR, the Andean regional satellite system - key legal considerations", Space Communication and Broadcasting, 1989, vol. 6, pp. 367-377.

"Pakistan steps up its space program", Space World, May 1985, p. 33.

Paolini, Jérôme, "French military space policy and European cooperation", Space Policy, vol. 4, No. 3, August 1988, pp. 201-210.

"PAXSAT could monitor space arms treaty", Military Space, 14 September 1987, pp. 6-7.

Payne, Jay H., "A limited antiballistic missile system", Ohio: Department of the Air Force, Air University, Air Force Institute of Technology, Defense Technical Information Center, 1990, pp. 2.13-2.24.

Pederson, Kenneth S., "Thoughts on international space cooperation and interests in the post-Cold War world", Space Policy, vol. 8, No. 3, August 1992, pp. 205-219.

Perry, Geoffrey, "Pupil projects involving satellites", Space Education, vol. 1, 1984, p. 320.

Piazzano, Piero, "Cosi un sogno ha potuto mettere le ali", Airone Spazio, Numero Speciale, Mo. 120, Aprile 1991, pp. 16-25.

Pike, Gordon, "Chinese launch services: a user's guide, Space Policy, vol. 7, No. 2, May 1991, pp. 103-115.

Pike, John, "Military use of outer space", World Armaments and Disarmament, SIPRI Yearbook 1991, Stockholm International Peace Institute, Oxford University Press, 1991, pp. 49-84.

_____, Sarah Lang and Eric Stambler, "Military use of outer space", World Armaments and Disarmament, SIPRI Yearbook 1992, Stockholm International Peace Institute, Oxford University Press, 1991, pp. 121-146.

Politi, Alessandro, "Italy plans military satellite network for early warning, reconnaissance", Defense News, 7 January 1991, pp. 3, 31.

"Portuguese balk at US radar, leaving US with blind spot", Space News, 9 October 1989, p. 4.

Potter, M., "Swords into ploughshares: missiles into commercial launchers", Space Policy, vol. 7, No. 2, May 1991, pp. 146-150.

Rains, Lon, "Soviets launch first ELINT spy satellite since 1988", Space News, 29 May 1990.

Rajan, Y. S., "Benefits from space technology: a view from a developing country", Space Policy, 4(3) August 1988, pp. 221-228.

Rankin, Robert, "Iraq still gets US satellite weather photos", The Philadelphia Inquirer, 22 January 1991, p. 9-A.

Rennow, Hans-Henrik, "The Information Revolution II: satellites and peace, The World Today, London, June 1989, pp. 97-99.

"Requests for proposals - Air Force Space Technology Center", SDI Monitor, 25 May 1990, p. 125.

"RFP for two more DSP satellites to be released Jan. 31", Aerospace Daily, 23 January 1991, p. 125.

Richelson, J., The U.S. intelligence community (Ballinger, Cambridge, MA, 1985), pp. 140-143.

Richelson, Jeffrey, "The future of space reconnaissance", Scientific American, January 1991, pp. 38-44.

Richter, Andrew, North American Aerospace Defence Cooperation in the 1990s: Issues and Prospects, Department of National Defense, Canada, Operational Research and Analysis Establishment, Extra-Mural Paper No. 57, July 1991.

Risse-Kappen, Thomas, "Star Wars controversy in West Germany", Bulletin of the Atomic Scientists, vol. 43, No. 6, July/August 1987, pp. 50-52.

Rossi, Sergio A., "La politica military spaziale Europea e l'Italia", Afari Esteri, anno XIX, No. 76, autunno 1987, pp. 521-533.

Rubin, Uzi, "Iraq and the ballistic missile scare", Bulletin of the Atomic Scientists, 46(8), October 1990, pp. 11-13.

Saint-Lager, Olivier de, "L'organisation des activités spatiales françaises: une combinaison dynamique du secteur public et du secteur privé", Annals of Air and Space Law, vol. vi, 1981, pp. 475-487.

Salvatori, Nicoletta, "Cosi un sogno ha potuto mettere le ali", Airone Spazio, Numero Speciale, No. 120, Aprile 1991, pp. 109-121.

"Satellite intelligence", Aviation Week and Space Technology, 25 February 1991, p. 13.

"Satellite trackers bag Soviet space station", Sky and Telescope, December 1987, p. 580.

Scheffran, Jiirgen and Aaron Karp, "The national interpretation of the missile technology control regime - the US and German experience", Controlling the Development and Spread of Military Technology: Lessons form the Past and Challenges for the 1990s, Vu University Press, Amsterdam 1992, pp. 235-251.

Scheffran, Jürgen, "Verification and risk for an anti-satellite weapons ban", Bulletin of Peace Proposals, vol. 17, No. 2, 1986, pp. 165-173.

_____, "Dual use of missile and space technologies", to be published in G. Neuneck, O. Ischebeck, Missile Technologies, Proliferation and Concepts for Arms Control, Hamburg 1992, pp. 1-16.

Scheffran, Jürgen, "Startbahn für den weltraumkrieg? - Der ASAT-Test und die Osterinsel", Informationsdienst Wissenschaft & Frieden, No. 4, 1985.

Scott, William B. and Stanley W. Kandebo, "NASA-AMES proposal could challenge NASP", Aviation Week and Space Technology, 14 September 1992, pp. 27-30.

"SDI constellation grows in brilliance", Military Space, 14 January 1991, pp. 3-4.

"SDIO plans to buy 4600 Brilliant Pebble interceptors", Defense Daily, 13 February 1990, p. 231.

"SDIO retools for limited threats", SDI Monitor, 21 December 1990, pp. 281-282.

"SDIO works up three limited-strike protection plans", SDI Monitor, 18 January 1991, p. 21.

"Secret images for Japan", Aviation Week and Space Technologies, 9 March 1992, p. 11.

Shastri, R., "The spread of ballistic missiles and its implications", Strategic Analysis, May 1988, pp. 157-168.

"Shuttle-Deployed Syncom IV-5 arrives on station, begins testing", Aerospace Daily, 19 January 1990, p. 110.

Simpson, John, Philip Acton and Simon Crowe, "The Israeli satellite launch: capabilities, intentions and implications", Space Policy, vol. 5, No. 2, May 1989, pp. 117-128.

"Sluggers pinch hit for Army GPS", Military Space, 24 September 1990, pp. 1, 8.

Smith, David, "The defense and space talks: moving towards non-nuclear strategic defenses", NATO Review, vol. 28, No. 5, October 1990, pp. 17-21.

"South Korea needs to develop spy satellite", Defense Daily, 26 November 1990, p. 312.

"Soviet Union launches military navigation satellite", Aerospace Daily, 20 September 1990, p. 471.

"Soviets announce failure of early warning satellite", Aerospace Daily, 28 June 1990, p. 518.

"Soviets confirm Cosmos 1900 difficulties", Aerospace Daily, 16 May 1988, p. 252.

"Soviets launch Mir resupply vehicle, two satellites", Aerospace Daily, 2 October 1990, p. 5.

"Soviets reject transition to strategic defenses - Hadley", Defense Daily, 22 March 1990, p. 458.

"Space surveillance contracts expected", Defense Electronics, June 1984, p. 19.

"Space surveillance deemed inadequate", Aviation Week and Space Technology, 16 June 1980, pp. 249-259.

"SSTS cost drivers identified", Military Space, 29 September 1986, p. 3.

Sta. Romana, Elpidio R., "Japan, SDI and the Pacific", Foreign Relations, pp. 105-123.

Stares, Paul B., "The military uses of space after the Cold War", Australia and Space, Desmond Ball and Helen Wilson (eds.), Strategic and Defence Studies Centre, Canberra, 1992.

Surikov, Boris, "Krasnoyarsk radar station's future considered", FBIS-Sov, 27 March 1990, pp. 2-3.

"Surveillance system to monitor Soviet ASATs", Defense Electronics, March 1983, p. 16.

"Swift development of China's missiles and space technology: an interview with Mr. Liu Jiyan, Vice-Minister of the Ministry of the Aerospace Industry of China", CONMILIT, vol. 3, No. 182, 1992, pp. 45-52.

Taylor, Trevor, "SDI - the British response", Star Wars and European Defence, Hans Günter Brauch (ed.), Houndmills: Macmillian Press, 1987, pp. 129-149.

_____, "Britain's response to the strategic defence initiative", International Affairs, vol. 62, No. 2, Spring 1986, pp. 217-230.

Teitelbaum, Sheldon, "Israel and Star Wars: the shape of things to come", New Outlook, vol. 28, No. 5/6, May/June 1985, pp. 59-62.

"The JDW Interview", Jane's Defence Weekly, 9 February 1991, p. 200.

"Third World countries are increasing their interest in space", SDI Monitor, 7 December 1990, p. 275.

Thomas, Paul, "Space traffic surveillance", Space/Aeronautics, November 1967, pp. 75-86.

Thomas, Raju G. C., "India's nuclear and space programs: defence or development?", World Politics, 38(2), January 1986, pp. 315-342.

"Transcarpathian Oblast radar project mothballed", FBIS-Sov, 22 August 1990, p. 51.

"TRW to develop $33-million USAF space surveillance network", Aviation Week and Space Technology, 22 May 1978, pp. 24-25.

Turner, R., "Brazil says missile technology controls hamper launch industry", Defense News, 24 July 1989, p. 18.

Ulsamer, Edgar, "ESD: enhancing effectiveness electronically", Air Force Magazine, July 1978, p. 49.

"USAF Asat test advances 1959 aircraft launch data", Aviation Week and Space Technology, 29 August 1983, p. 22.

"US increasing coverage of Soviet space launches", Defense Daily, 15 April 1986, p. 251.

"U.S. upgrading ground-based sensors", Aviation Week and Space Technology, 16 June 1980, pp. 239-241.

van Reeth, George and Kevin Madders, "Reflections on the quest for international cooperation", Space Policy, vol. 8, No. 3, August 1992, pp. 221-231.

von Welck, Stephan F., "India space program", Space Policy, vol. 3, No. 4, November 1987, pp. 326-334.

Vohra, Ruchita, "Iraq joins the missile club: impact and implications", Strategic Analysis, 13(1), April 1990, pp. 59-68.

Weeb, Richard L., "Estimating the life cycle cost of the space exploration initiative", Space Policy, vol. 8, No. 1, February 1992.

Welk, S. F. von, "The export of space technology: prospects and dangers", Space Policy, August 1987, pp. 221-231.

Wells, Damon R. and Daniel E. Hastings, "The US and Japanese space programmes: a comparative study", Space Policy, vol. 7, No. 3, August 1991, pp. 233-256.

Williamson, Mark, "The UK Parliamentary Space Committee", Space Policy, vol. 8, No. 2, May 1992, pp. 159-165.

Wilson, A., "Non-US launcher systems for the next decade", Interavia, July 1988, No. 7, p. 687.

Wood, Lowell, "Concerning advanced architectures for strategic defense", Lawrence Livermore National Laboratory Preprint UCRL-98424, 13 March 1988.

_____, "Brilliant Pebbles missile defense concept advocated by Livermore scientist", Aviation Week and Space Technology, 13 June 1988, pp. 151-155.

Wu, Guoxiang, "China's space communications goals", Space Policy, vol. 4, No. 1, February 1988, pp. 41-45.

Yang, Chunfu, "China's LONG MARCH series carrier rockerts", Military World, May 1989, pp. 20-25.

Zaloga, Steven, Soviet air defence missiles, Jane's Information Group, Coulsdon, Surrey, 1989, pp. 118-148.

Zaloga, Steve, "Soviet radars draw opposition", Armed Forces Journal International, June 1990, p. 21.

Zhukov, G. and Y. Kolosov, International Space Law, 1984.

Zorpette, Glenn, "Kwajalein's new role", IEEE Spectrum, March 1989, pp. 64-69.

2. Books, special studies and reports

Anti-satellite weapons, countermeasures, and arms control, Office of Technology Assessment, report no. OTA-ISC-281, September 1985.

Atlas géographic de l'espace. Sous la direction de Fernand Verger, Sides-Reclus, 1992.

Balaschak, M. et al., Assessing the comparability of dual-use technologies for ballistic missile development, Cambridge, M.A.: Center for International Studies, June 1981.

Ball, Desmond, A base for debate (Allen and Unwin, London, 1987).

Berman, R. P. and J. C. Baker, Soviet strategic forces, Washington, D.C.: Brookings, 1982.

Birkholz, M. et al., Die Bundesrepublik als Heimlicher Waffenexporteur, Berlin: Arbeitskreis Physik und Rüstung, 1983.

Brauch, Hans Günter, Henny J. Van Der Graaf, John Grin and Wim A. Smit (eds.), Controlling the development and spread of military technology: lessons form the past and challenges for the 1990s, Vu University Press, Amsterdam 1992, 406 pp.

Bunn, Matthew, Foundation for the future: the ABM treaty and national security, Washington, D.C.: The Arms Control Association, 1990.

Carus, W. S., Ballistic missiles in modern conflict, Praeger, 1991.

Cochran, C. D., D. M. Gorman and J. D. Dumoulin (eds.), Space handbook, Air University Press, January 1985.

Cochran, T. B., W. M. Arkin, R. S. Norris and J. I. Sands, Nuclear weapons databook: Soviet nuclear weapons, vol. IV, New York, Harper and Row Publishers, 1989.

Colloque: activités spatiales militaires, Association Aeronautique et Astronautique de France, Gap, Imprimerie Louis-Jean, mai 1989, 382 pp.

Christol, C., The Modern International Law of Outer Space, 1982.

Chayes, Antonia H. and Paul Doty (eds.), Defending deterrence: managing the ABM treaty regime into the 21st century, Washington, Pergamon/Brassey's, 1989.

Dorn, Walter, Peace-keeping satellites: the case for international surveillance and verification, Dundas, Peace Research Institute, 1989, Peace Research Reviews, 187 pp.

Dolye, Stephen, Civil uses of outer space: implications for international security, UNIDIR, New York, 1991.

Disarmament: problems related to outer space, UNIDIR, New York, United Nations Publication, 1987, 190 pp.

Gasparini Alves, Pericles, Prevention of an arms race in outer space: a guide to discussions at the conference on disarmament, New York: UNIDIR, 1991, 203 pp.

Gatland, K., Space technology, New York: Harmony Books, Fourth Edition 1984.

Gold, D., SDI - the US Strategic Defense Initiative and the implications of Israel's participation, Center for Strategic Studies, Tel Aviv, Memorandum No. 16, December 1985.

Gummett, P. and J. Reppy (eds.), The Relations between defence and civil technologies, Kluwer Academic Publishers, 1988.

Hecht, J., Beam weapons - the next arms race, Plenum Press, 1984.

Hord, R. M., CRC handbook of space technology: status and projections, Boca Raton, Florida, 1985.

Huang, Z., Long March launch vehicles in the 1990s, in Sharokhi, F. et al., Space commercialization: launch vehicles and programs, Washington, D.C.: American Institute of Aeronautics and Astronautics, 1990, pp. 1-6.

Jasani, Bhupendra, Space and international security, London, Royal United Services Institute, 70 pp.

_____, ed., Peaceful and non-peaceful uses of space: problems of definition for the prevention of an arms race, UNIDIR, 1991.

_____, Space weapons and international security, Oxford, Oxford University Press, 1987.

_____, Outer space-battlefield of the future?, London, Taylor and Francis, 1978.

Johnson, Nicholas L. (ed.), The Soviet year in space, Colorado Springs: Teledyne Brown Engineering, 1989.

_____ (ed.), The Soviet year in space, Colorado Springs: Teledyne Brown Engineering, 1990.

_____ and Darren S. McKnight, Artificial space debris, Malabar: Orbit Book Company, 1987.

King-Hele, Desmond, Observing earth satellites (Macmillan, London, 1983).

Krige, John, The prehistory of ESRO: 1959/1960, European Space Agency, HSR-1, July 1992.

"Le Grandi Esplorazioni nel mondo sopra de noi", Airone Spazio, Numero Speciale, No. 120, Aprile 1991.

Milton, A. Fenner, M. Scott Davis and John A. Parmentola, Making Space Defense Work, Washington, Pergamon/Brassey's, 1989.

Nolan, Janne E, Trappings of power: ballistic missiles in the Third World, The Brookings Institution, Washington, D.C., 1991, 209 pp.

Outer space in the 1990s: the role of arms control, security, technical and legal implications, Proceedings of the Symposium, held on November 11-12-13, 1992. Centre for Research of Air and Space Law, McGill University, Canada, 258 pp.

Raiten, E. and K. Tsipis, Conventional antisatellite weapons, Program in Science and Technology for International Security, MIT, Cambridge, March 1984.

Reijnen, G. C. M. and W. de Graff, The pollution of outer space, in particular of the geostationary orbit, Dordrecht, Martinus Nijhoff Publishers, 1989.

Richelson, Jeffrey, The U.S. intelligence community, Ballinger, Cambridge, Ma. 1985.

_____, America's secret eyes in space, New York, Harper and Row, 1990.

Rudert, R., K. Schichl and S. Seeger, Atomraketen als Entwicklungshilfe, Marburg 1985.

Seiler, A., Die Entstehung und Entwicklung von Eureka, Diplomarbeit, Berlin, 1988.

Sofaer, Abraham D., The ABM Treaty, Part I: treaty language and negotiating history, 11 May 1987.

_____, The ABM Treaty, Part II: ratification process, 12 March 1987.

_____, The ABM Treaty, Part III: subsequent practice, 9 September 1987.

Space Log: 1957-1991, International Space Year, 1992, TRW, 1992.

Space-strike arms and international security, Report of the Committee of Soviet Scientists for Peace Against the Nuclear Threat, Moscow, October 1985.

Steinberg, G. M., Satellite reconnaissance: the role of informal bargaining, New York, Praeger, 1982.

Space surveillance for arms control and verification: options, proceedings of the symposium held on October 21-23, 1988, Centre for Research of Air and Space Law, Montreal, McGill University, Centre for Research of Air and Space Law, 1988.

Stanyard, Roger, World satellite survey, London, LLoyd's Aviation Department, 1987.

Stares, Paul, The militarization of space: US policy 1945-84, Ithaca, New York: Cornell University Press, 1985, p. 117.

Sutton, G. P., Rocket propulsion elements, New York, etc., John Wiley, 1986.

Swahn, Johan, Open skies for all: the prospects for international satellite surveillance, Gothenburg, Technical Peace Research Unit, January 1989, Chalmers University of Technology, 74 pp.

Stutzle, W., B. Jasani and R. Cowen (eds.), The ABM treaty: to defend or not to defend, Oxford, Oxford University Press, 1987.

Long, F. A., D. Hafner and J. Boutwell (eds.), Weapons in space, New York, W. W. Norton and Company, 1986.